



FRIDAY, APRIL 17, 1903.

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## Contributions

## Wrong Repairs to Trojan Couplers.

Troy, N. Y., April 1, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Will you kindly bring the following subject, which we believe will be interesting, to the notice of your readers:

It has been brought to our attention recently that some railroad companies are replacing, when broken, the drop forged steel operating rods of Trojan couplers, with cast-iron, malleable iron or cast-steel imitations of these rods.

The impropriety of such replacements will be conspicuously apparent to the railroad operating departments, particularly since these imitations do not even conform in essential dimensions, and we trust that they will give instructions to inspectors at interchange points to be on the lookout for such improper repairs.

The incident will bring to the minds of some the similar practice of replacing broken knuckles with those made of gray iron and malleable iron in the early '90s.

THE TROJAN CAR COUPLER CO.

## The Mississippi River Overflow.

New Orleans, La., April 7, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The statement concerning this year's high water in the Mississippi in your "Scrap Heap" of April 3, is not entirely correct.

No destruction from water has occurred since 1897. In that year there were 38 breaks in the levees between Cairo and New Orleans, about 965 miles. This year, although the flood height exceeded that of 1897 in most places, and in some as much as 2½ ft., there have been only five breaks in that part of the river, owing to the improvement in the levee system during the past five years. Among these is the Hymelia crevasse, which, instead of being beyond control, has been closed and the railroads have resumed operation.

The relative areas overflowed in 1897 and 1903 is reduced in proportion to the number of breaks. The flood, with its danger, has not entirely passed from the lower part of the river, but this statement is correct up to date.

B. M. HARROD, C.E.

## Umbrella Sheds.

New York, April 13, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am thoroughly in accord with the general views expressed in the editorial on "Umbrella Sheds" in your issue of April 10, namely, that too much stress is laid on the absolute necessity of having a large expensive train-shed at passenger terminal stations. In many cases a judicious arrangement of platform roofs and cross-roofs will give better results than a low, inadequate and badly designed train-shed.

In my book, "Buildings and Structures of American Railroads," published in 1893, I called attention to the

constant need of repairs on a large train-shed, and the large first cost. Excepting during very stormy weather, this system provides ample protection for passengers and baggage. The deafening noise from trains and engines, which renders a great many train-sheds very objectionable, is done away with. The noise of escaping steam from cylinders or safety valves, the ringing of the bell, and the sounds accompanying the slipping of the drivers in starting a heavy train, often render a large shed a nuisance.

WALTER G. BERG.

## Arboriculture on the Michigan Central.

Detroit, Mich., April 8, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have your letter asking for information as to methods employed on this road for the embellishment of station grounds.

Years ago greenhouses were established at Ypsilanti and Niles where our station grounds are quite extensive and lay of ground is such that they could be planted and ornamented at comparatively slight expense. Year by year we have continued the work of planting, and now many of our station grounds on both main line and branches are much more pleasing to the eye than in their original condition. This work is in charge of the Engineering Department under the direction of a Chief Gardener. The expense amounts to but very little and will decrease rather than increase, as it is now our policy to use hardy shrubs for ornamentation rather than blooming or foliage plants. These shrubs are being propagated at various points and when additional planting is ordered we generally have or expect to have necessary stock without purchasing on the market.

Patrons of the road and citizens at practically all of our stations are taking a great interest in the work, and it is very seldom a request is made by a committee of citizens from any town along the line for a little attention on our part that does not carry with it an offer of assistance in the nature of grading, laying water pipes, etc. This, of course, reduces the expense to a minimum as the planting takes but little time and grounds are taken care of by some necessary attaché of the station, as he finds time to devote to such work. The greenhouses referred to, in addition to furnishing small floral offerings for lady passengers on our trains, provide and care for plants, palms, ferns, etc., to be found in all our dining halls and dining cars.

I have given you a rough and hurried outline of methods at present employed on this line of work and I hope for their continuance. In addition to embellishing station grounds, we are interested in the cultivation of catalpas. This work is comparatively young with us, but we have many thousand trees planted at outlying stations which are being added to yearly and watched with interest.

W. S. KINNEAR,

Chief Engineer, Michigan Central Railroad.

[The beginning of this work had some amusing incidents. In 1892 Mr. Hawks became chief engineer. His energy was restless. In the early spring he brought down from the Mackinac line several barrels of trailing arbutus, and had these sweet-smelling May flowers tied in small bouquets and attached to a small card: "With the compliments of the Engineering Department." Passenger train conductors were easily induced to distribute these souvenirs among the women passengers. Called to account, Hawks explained that he was only letting people know that there was such a thing as an engineering department. He was acquitted of the charge of interfering with the business of another department on the ground that he had a right to advertise his own. When the May flower season passed, some ladies' aid societies of churches at Ypsilanti and other cities contracted to furnish the engineering department with small bouquets, at a moderate price, the proceeds to be devoted to the spread of gospel, that is, the maintenance of the churches. This continuance of activity caused a second inquiry, and Hawks' reply that, as an engineer, he was only "adapting the forces of nature to the uses of man" was not considered fully responsive. It was developed that he had paid all costs from his own pocket, and also that he had begun the greenhouse at Ypsilanti. The value of the idea had been so well shown that the engineering department was formally authorized to go ahead, but the passenger department took charge of the "floral offerings."—EDITOR.]

## Some Railroad Stories.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A few reminiscences from an old railroader's diary may be of interest at this time. Railroad accidents usually are caused by carelessness or negligence on the part of employees; some permitting themselves to be overworked; some are naturally indifferent and careless. The former are excusable to a certain degree, while for the latter there is no justification. Take, for instance, the appalling accident at Tucson, Ariz., the latter part of last January. Superintendent Agler, of that road, is quoted by the newspapers as saying: "We have made up our minds where the blame belongs. . . . The wreck was due to the fault of the operator. . . . The whole story is told in two words: 'He forgot.'" Yes, "he forgot," as operators sometimes do who are overworked. That boy wrote home to his parents time and again telling them this. It seems to me the superintendent ought to have been aware of this. Twelve hours a day, or night, as the

case may be, acting as operator, ticket agent, baggage-man, switchman, and frequently manager of a commercial telegraph office, as well as other minor duties, is almost too much for human nature to stand, and is certainly more than should be imposed upon one person. A young, active man, frequently a mere boy, is selected for this responsible work. I know this, as I speak from experience. Under these conditions who is most to blame for these terrible accidents and the harrowing scenes attending them? The young and overworked operator, or the older and more experienced superintendent?

Many years ago an operator but 14 years of age worked night and day as operator and ticket agent for a period of nearly two weeks at a stretch. The result was that at the end of this time he dozed off one night, got up in his sleep and took a train order for a down special engine to cross an up wood train at his station. When he awoke, about 5 a.m., he discovered the order on his desk, in his own handwriting. It had been received and replied to, as the marks on it indicated. This was all the knowledge he had of it; he did not remember having received it. He immediately turned the signal in front of the station, and walked out on the platform only to observe the down special engine coming up. It had passed by while he was sleeping, and, on turning a curve a couple of miles away the engineer discovered the wood train coming towards him, and, thinking discretion the better part of valor, stopped and backed up.

Nothing serious happened in this instance, but the question arises, Who would have been most to blame had an accident resulted—the operator in short pants, or the superintendent, who ought to have been cognizant of what was going on?

A peculiar thing happened on the Missouri Pacific at Lexington, Mo., a few years ago. A freight train reached that station about noon, and the train hands went across the way to a lunch stand for something to eat. On returning from luncheon, the fireman and one of the brakemen, being a little in advance of the others, discovered that three empty flat cars which, for convenience sake, had been placed in front of the engine, had disappeared, and, so far as the eye could reach down the line, were not visible. They knew that the cars must have broken away, or had been released from the engine by some mischievous person, and sent spinning down the grade as fast as they could go, into the face of a passenger train which was due at the next station in a few minutes. So they disconnected the engine from the rest of the train, jumped aboard, pulled wide open the throttle and started on a race for life after those cars. Three miles below was a curve. On turning this they could see the three flat cars about three miles ahead, bouncing and jumping along, swaying from side to side, and making the very best time they could. The fireman, acting as engineer, realized that he must catch those cars in the next five minutes or it was all up with the passenger train, which was coming toward them only a few miles away. He pulled the throttle wide open, the brakeman, acting as fireman, worked like a Trojan, shoveling in the coal, and away the engine sped, and nearer the runaway cars they came. Looking over and ahead of them they could see the express just coming into Aullville. As they drew nearer the cars the brakeman climbed out of the cab window, a coupling-pin in his hand, making his way along the side of the engine to the pilot in front. Reaching over and grasping the pilot-bar with one hand, raised it, and, with a coupling-pin in the other, stood ready to make the connection. The fireman at the throttle waited for the signal. He saw a hand come out from the side of the engine, which told him the connection was made. He quickly reversed his lever, and in a few seconds they came to a standstill.

One night, some years ago, on the Santa Fe road, the night operator at P— was enjoying a short nap with his head resting on his arms, which were folded on the table, when the dispatcher called him. He was all attention in a moment, received a crossing order for the down express to cross the up "flyer" at his station. He replied to it in proper form. He had been asleep, but had aroused himself for the time being and had taken upon himself a heavy responsibility. But he was tired, and hesitated a moment before rising from his chair and pulling the cord that turned the signal in front of the station. His head fell over and rested on his arms again; he was fast asleep. The "flyer" and fast express were rushing toward each other, some distance away, to be sure, but surely and swiftly nearing each other. The operator slept on. The "flyer" reached P— and flew past the station. The operator awoke, grasped his lantern, rushed through the doorway and out to the platform, only to see the rear lights of the flyer disappearing in the distance. He swung his red lantern, but to no purpose; it was too late.

When he rushed out to the platform he had left the doors open behind him. Suddenly he heard the sound of his instrument; the dispatcher was calling him. He hesitated a moment; he trembled all over. Should he answer his call? He realized that he had been derelict in his duty and an awful collision seemed sure. It almost made him a coward for the moment, but hadn't he worked night and day for the past week? The agent's wife had died and he had done double duty. Would not this excuse him? He hurried into his office and answered his call. The dispatcher sent an order annulling the one which had been the cause of the operator's awful anxiety; the flyer could safely go on to the next station because the express had been delayed by a hot box.

The operator felt better.

C. W. THAYER.

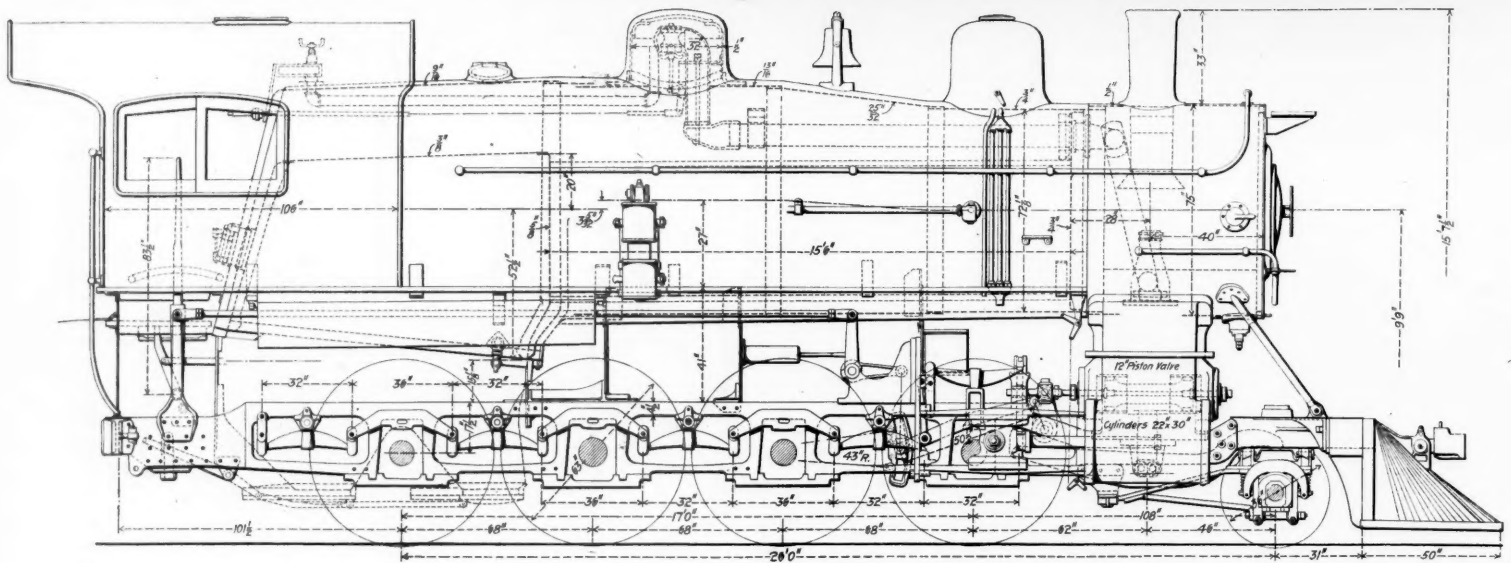
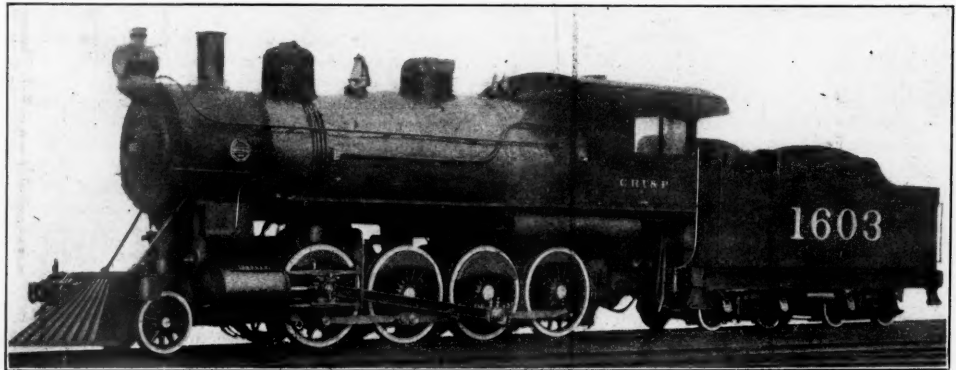
### Northern Securities Company Declared Illegal.

By a decision of the United States Circuit Court of Appeals, for the Eighth Circuit, handed down at St. Paul, April 9, The Northern Securities Company, formed in 1901 to own the stock of the Northern Pacific and the Great Northern Railroads, is declared to be an illegal combination in restraint of trade, and therefore repugnant to the Sherman anti-trust law of 1890. The plaintiff is the Attorney-General of the United States, and the beginning of the suit was noticed in the *Railroad Gazette* of Feb. 28 and March 14, 1902. The decision is by Judge Thayer, and is concurred in by Judges Caldwell, Sanborn and Van Devanter, the court being unanimous. The order holds that the shares of stock, of the two railroads named, which are held by the Securities Company were acquired in virtue of a combination among the defendants (among whom are James J. Hill, William P. Clough, D. Willis James, John S. Kennedy, J. Pierpont Morgan, Robert Bacon, George F. Baker and Daniel Lamont) in restraint of trade. The Securities Company is enjoined from acquiring or attempting to acquire further stock of either of said companies; also from voting such stock at any meeting of the stockholders of either of said railroad companies or exercising or attempting to exercise any control, direction, supervision or influence over the acts of said companies, or either of them, by virtue of its holding such stock; enjoining the Northern Pacific and Great Northern companies respectively, their officers, directors, and agents, from permitting such stock to be voted by the Northern Securities Company, or any of its agents or attorneys on its behalf, at any corporate election for directors or officers of either of said companies, and likewise enjoining them from paying any dividends to the Securities Company on account of said

sons they would have violated the anti-trust law, and doing it through an artificial person of their own creation does not alter the essential fact. It will not do to say that so long as each railroad company has its own board of directors they operate independently and are not controlled by the owner of the majority of their stock. It is the common experience of mankind that the acts of corporations are dictated and that their policy is controlled by those who own the majority of their stock. Indeed, one of the favorite methods in these days—and about the only method of obtaining control of a corporation—is to purchase the greater part of its stock. It was the method pursued by the Northern Pacific and Great Northern companies to obtain control of the Chicago, Burlington & Quincy Railroad, and so long as directors are chosen by stockholders the latter will necessarily dominate the former, and in a real sense determine

The argument that if the existing combination is held to be one in violation of the Anti-Trust act and unlawful, then the act unduly restricts the right of the individual to make contracts, buy and sell property and is invalid for that reason, is met and answered by the decision in *Addyston Pipe & Steel Company vs. U. S.* (175 U. S. 228, 229,) where it is said that Congress may declare void and prohibit the performance of any contract where the natural and direct effect of such a contract will be, when carried out, to directly, and not as a mere incident to other and innocent purposes, regulate, to any substantial extent, interstate commerce.

As to the constitutional guarantee of liberty to the individual to enter into private contracts, the provision of the Constitution does not exclude Congress from legislating with regard to contracts of the above nature while in the exercise of its Constitutional right to regulate com-



stock, or permitting or suffering the Securities Company to exercise any control whatsoever over the corporate acts of said companies, or to direct the policy of either. The order permits the Securities Company to return to the stockholders of the N. P. and G. N. the shares of stock of those companies for which Northern Securities stock has been given in exchange, or to transfer them to the present holders of its own stock which was issued in exchange.

The opinion recites that the roads have been and are competitors; that in 1901 they united in purchasing 98 per cent. of the stock of the Chicago, Burlington & Quincy and became joint sureties for the payment of Burlington bonds. Subsequently, certain large and influential stockholders of the N. P. and G. N. formed the Securities Company under a New Jersey charter; and this company now owns 96 per cent. of the stock of the N. P. and 76 per cent. of the G. N.

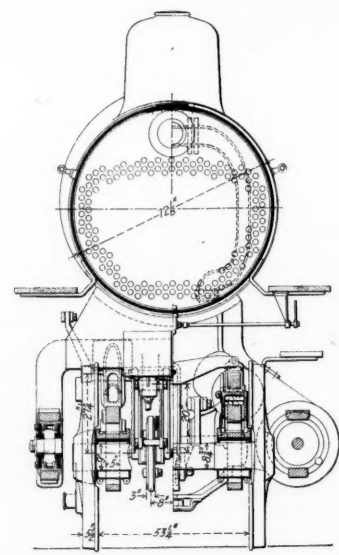
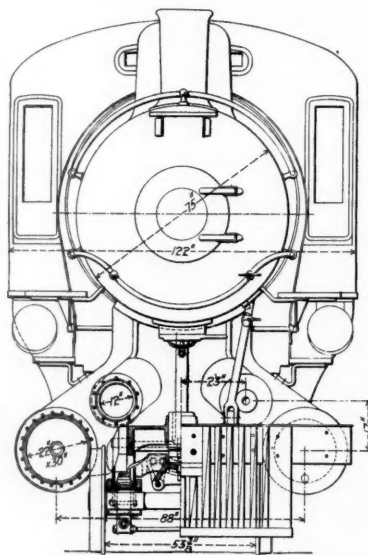
"The scheme which was thus devised and consummated led inevitably to the following results:

"First.—It placed the control of the two roads in the hands of a single person, to wit, the Securities Company, by virtue of its ownership of a large majority of the stock of both companies.

"Second.—It destroyed every motive for competition between the roads engaged in interstate traffic which were natural competitors for business, by pooling the earnings of the two roads for the common benefit of the stockholders of both companies.

"And, according to the familiar rule that every one is presumed to intend what is the necessary consequence of his own acts when done wilfully and deliberately, we must conclude that those who conceived and executed the plan aforesaid intended, among other things, to accomplish these objects."

The decision then goes on to show, from the opinions of the Supreme Court in the *Trans-Missouri Freight Association* and the *Joint Traffic Association* cases that the anti-trust law does not refer merely to unreasonable restraint of trade, but prohibits any contract which tends to prevent competition; it is not material whether the freight rates fixed are reasonable or unreasonable. The vice of the contract is the power which it confers to establish unreasonable rates. It is plain that if the defendants had made their combination through natural per-



Rock Island Consolidation (2-8-0) Locomotive.

all important corporate acts. The suppression of competition, and to that extent the restraint of commerce, is a natural and inevitable result of the single ownership of all or nearly all of the stock of two competing railroads. "The Northern Securities Company has acquired the power (and has made provision for maintaining it) to suppress competition between two interstate carriers, who own and operate competing and parallel lines of railroad. Competition, we think, would not be more effectively restrained than it now is under and by force of the existing arrangement if the two railroad companies were constructed under a single charter."

The law of New Jersey under which the Securities Company is organized, grants its powers "for any lawful purpose," so that the State of New Jersey virtually forbids a corporation to set at defiance any statute lawfully enacted by Congress or by another State.

merce among the States. The provision regarding the liberty of the citizen is to some extent limited by the commerce clause of the Constitution and the power of Congress to regulate interstate commerce comprises the right to enact a law prohibiting the citizen from entering into those private contracts which directly and substantially, and not merely indirectly, remotely, incidentally and collaterally, regulate to a greater or less degree commerce among the States.

The defense claimed that the anti-trust law was not intended to prohibit the virtual consolidation of railroads, even though such consolidation stifled competition; and also that the combination was formed in aid of commerce and not to restrain it, being intended to enlarge the volume of interstate traffic and thus benefit the public; but these propositions are held to be untenable. Congress aimed to destroy the power to place any direct restraint

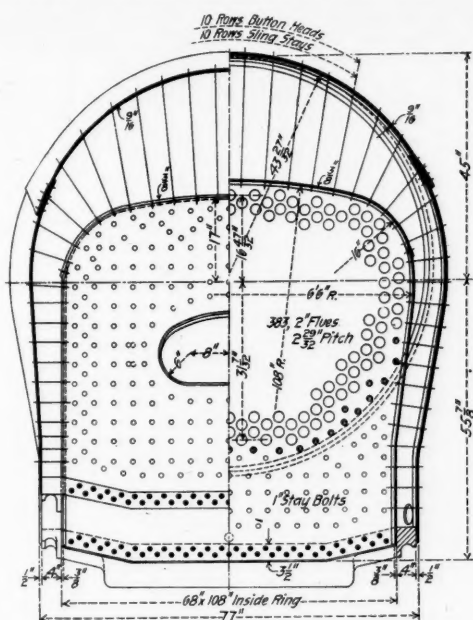


on interstate commerce. As to motive, "It may be that such a virtual consolidation of parallel and competing lines of railroads as has been effected, taking a broad view of the situation, is beneficial to the public rather than harmful. It may be that the motives which inspired the combination by which this end was accomplished were wholly laudable and unselfish; that the combination was formed by the individual defendants to protect great interests which had been committed to their charge; or that the combination was the initial and necessary step in the accomplishment of great designs, which, if carried out as they were conceived, would prove to be of inestimable value to the communities which those roads serve and to the country at large.

"We shall neither affirm nor deny either of these propositions, because they present issues which we are not called upon to determine, and some of them involve questions which are not within the province of any court to decide, involving, as they do, questions of public policy which Congress must determine."

#### Rock Island Consolidation (2-8-0) Locomotive.

The locomotive shown herewith is one of an order for 135 now building at the Brooks Works of the American Locomotive Company for the Chicago, Rock Island & Pacific. It is the heaviest and most powerful locomotive yet built for the Rock Island. The total weight in working order is 262,500 lbs., with 182,000 lbs. on the drivers, and the total heating surface is 3,264 sq. ft. The cylinders are 22 in. x 30 in., and the boiler pressure is 200 lbs. Assuming that 85 per cent. of the boiler pressure is



Section Through Fire-box.

available at starting, the maximum tractive effort is 39,200 lbs. Assuming that the maximum speed at which it is safe to run this locomotive is 60 miles an hour (320 revolutions a minute), it is interesting to estimate the maximum tonnage that could be continuously moved at that speed. Tests show that the maximum rate of evaporation for a locomotive boiler is about 15 lbs. per sq. ft. of heating surface per hour. The total maximum evaporation of the boiler is then  $15 \times 3,264 = 48,960$  lbs. an hour. At 26 lbs. of water per indicated horse power per hour, the maximum power developed would be  $\frac{48,960}{26} = 1,883$

h.p. About 30 per cent. of this power is absorbed by the locomotive in overcoming the wind resistance, rolling and mechanical friction, etc., so that only about 1,318 h.p. appears at the drawbar. By Wellington's formula, the train resistance at 60 miles an hour is 17 lbs. per ton so that each ton hauled at that speed requires  $\frac{17 \times 60 \times 5,280}{60 \times 33,000} = 2.72$  h.p. The total tonnage that can be hauled is, therefore, 1,318 divided by 2.72, or 485 tons. Under these conditions the coal consumption would be about 7,000 lbs. an hour, or 140 lbs. per sq. ft. of grate surface.

The detail of particular interest in this locomotive is the valve mechanism. The piston valves have inside admission and are brought close to the cylinders so that the total clearance does not exceed 7 per cent. This makes necessary the use of a double valve-rocker-arm. The inside arm connects directly to the link, while the outer arm operates the valve stem through a block and slot arrangement. The motion bar is slightly cambered to clear the forward axle. The angularity of the motion bar subjects it to unusual strains, and in order to resist side bending the rod is strengthened by webs.

Some of the typical ratios follow:

|  |      |
|--|------|
| Wt. on drivers divided by maximum tractive effort.....     | 4.65 |
| Wt. on drivers divided by total heating surface.....       | 55.8 |
| Heating surface divided by grate area.....                 | 65.3 |
| Tube surface divided by fire-box heating surface.....      | 17.5 |
| Heating surface divided by cylinder volume (one side)..... | 247  |
| Grate area divided by cylinder volume (one side).....      | 3.79 |

The interesting features disclosed by the above table are the ratio between weight on drivers and tractive effort and the ratio between tube heating surface and fire-box heating surface. The first named ratio of 4.65 shows that the engine is, at least, not over-cylindrical. Also a large

part of the total heating surface is in the fire-box, which no doubt adds to the steaming capacity of the boiler.

A general description follows:

|                              |              |
|------------------------------|--------------|
| Kind of fuel to be used..... | Bituminous   |
| Weight on drivers.....       | 182,000 lbs. |
| Weight on truck wheels.....  | 20,500 lbs.  |
| Weight, total.....           | 202,500 lbs. |
| Weight tender loaded.....    | 145,000 lbs. |

#### General Dimensions.

|  |                  |
|--|------------------|
| Wheel base, total, of engine.....          | 26 ft.           |
| Wheel base, driving.....                   | 17 ft.           |
| Wheel base, total (engine and tender)..... | 57 ft. 6 in.     |
| Height, center of boiler above rails.....  | 9 ft. 2 in.      |
| Height of stack, above rails.....          | 15 ft. 7 1/2 in. |
| Heating surface, fire-box.....             | 177 sq. ft.      |
| Heating surface, tubes.....                | 3,087 sq. ft.    |
| Heating surface, total.....                | 3,264 sq. ft.    |
| Grate area.....                            | 50 sq. ft.       |

#### Wheels and Journals.

|                                   |                           |
|-----------------------------------|---------------------------|
| Drivers, number.....              | 8                         |
| Drivers, diameter.....            | 63 in.                    |
| Drivers, material of centers..... | Cast steel                |
| Truck wheels, diameter.....       | 36 in.                    |
| Journals, driving axle, size..... | 10 in. and 9 in. x 12 in. |
| Journals, truck axle, size.....   | 6 in. x 12 in.            |
| Main crank pin, size.....         | 7 in. x 7 in.             |

#### Cylinders.

|                                 |            |
|---------------------------------|------------|
| Cylinders, diameter.....        | 22 in.     |
| Piston, stroke.....             | 30 in.     |
| Piston rod, diameter.....       | 4 in.      |
| Kind of piston rod packing..... | Snap rings |
| Steam ports, length.....        | 29 in.     |
| Steam ports, width.....         | 2 in.      |
| Exhaust ports, area.....        | 65 sq. in. |
| Bridges, width.....             | 3 3/4 in.  |

#### Valves.

|                        |             |
|------------------------|-------------|
| Kind of.....           | Piston      |
| Greatest travel.....   | 5 13/16 in. |
| Steam lap.....         | 1 in.       |
| Clearance.....         | 0 in.       |
| Lead in full gear..... | 3/32 in.    |

#### Boiler.

|                                      |                    |
|--------------------------------------|--------------------|
| Type of.....                         | Extended wagon top |
| Working steam pressure.....          | 200 lbs.           |
| Thickness of material in barrel..... | 3/4 in.            |
| Diameter of barrel.....              | 72 1/4 in.         |
| Seams, kind of horizontal.....       | Sextuple butt      |
| Seams, kind of circumferential.....  | Double             |
| Crown sheet stayed with.....         | Radial stays       |

#### Fire-box.

|                          |   |
|--------------------------|---|
| Length.....              | 9 ft.                                   |
| Width.....               | 5 ft. 8 in.                             |
| Depth, front.....        | 75 1/2 in.                              |
| Depth, back.....         | 61 1/2 in.                              |
| Material.....            | Carbon acid steel                       |
| Thickness of sheets..... | 3/8, 3/4 and 1/2 in.                    |
| Water space, width.....  | Front, 4 in.; sides, 4 in.; back, 4 in. |
| Grate, kind of.....      | Rocking                                 |

#### Tubes.

|                         |               |
|-------------------------|---------------|
| Number.....             | 383           |
| Material.....           | Charcoal iron |
| Outside diameter.....   | 2 in.         |
| Length over sheets..... | 15 ft. 6 in.  |

#### Smoke-box.

|               |        |
|---------------|--------|
| Diameter..... | 75 in. |
| Length.....   | 68 in. |

#### Other Parts.

|                                       |            |
|---------------------------------------|------------|
| Exhaust nozzle, single or double..... | Single     |
| Exhaust nozzle, diameter.....         | 5 1/2 in.  |
| Stack, straight or taper.....         | Taper      |
| Stack, least diameter.....            | 15 in.     |
| Stack, greatest diameter.....         | 16 3/4 in. |

#### Tender.

|   |                    |
|---|--------------------|
| Type.....   | 8-wheel            |
| Tank capacity for water.....  | 7,000 gal.         |
| Coal capacity.....  | 15 tons            |
| Underframe.....   | 13-in. channels    |
| Type of truck.....  | Brooks             |
| Diameter of truck wheels.....   | 33 in.             |
| Diameter and length of axle journals.....   | 5 1/2 in. x 10 in. |
| Westinghouse automatic brakes for tender and train with 9 1/4-in. air pump; American outside equalized brakes on all drivers. |                    |

#### Trade Union Contract—A Standard Form.

Memorandum of agreement made and entered into this ... day of ..., 19.., between the ..... Railway, party of the first part, and the Amalgamated Association of Street Railway Employees of America, Division No. ...., party of the second part.

Witnesseth, That in the operation of the lines of the party of the first part both parties mutually agree:

Section 1.—That the party of the first part, through the properly accredited officers, will treat with its employees through the Amalgamated Association of Street Railway Employees of America, Division No. ...., through their properly accredited officers and committees.

Section 2.—The properly accredited officers of the Association shall have full power to adjust all differences that may arise between the parties hereto with the properly accredited officers of the company. All differences shall be submitted to the Superintendent or Manager of the company by the properly accredited officers of the Association, and if they cannot agree the President, or in his absence, the Secretary of the company, shall be called to the conference. If, after such conference, there still remains a disagreement the properly accredited officers of the Association shall have power to order the case to arbitration at once. The Board of Arbitrators shall consist of three disinterested persons, one of whom shall be chosen by each of the parties hereto. A third shall be chosen by the two first selected. The finding

of the majority of the said Board shall be binding on both parties hereto, the cost and expense of which shall be paid as follows: Each party to pay its own arbitrator and both parties shall jointly pay the third arbitrator.

Section 3.—That all business arising between the parties hereto shall be transacted directly by the properly accredited officers of the company and the properly accredited officers of the Association, respectively. Any member of this Association under this agreement laid off, and after investigation, found not guilty shall be reinstated in his former position and paid for time lost.

Section 4.—That any member of this Association by act or word interfering with or disturbing the course of negotiations between the properly accredited officers of the company and the Association, respectively, upon any subject whatsoever, or interfering with or disturbing the service in any manner contrary to the conditions and spirit of this agreement shall, upon mutual satisfactory proof of the same, be dismissed from the service.

Section 5.—That all members of the Association in the service of the company shall be entitled to free transportation over all lines owned or operated by the company. Said free transportation to consist of book tickets or annual card passes the same as now in use.

Section 6.—In all cases where the officers of the company charge a member of the Association with any offence said charge shall be specified in writing and a copy of the same be furnished to the Secretary of the Association within five (5) days after the alleged offence is committed.

Section 7.—In case the Association suspend a member who is an employee of the company for any violation of their laws or rules it shall request his suspension in writing, signed by the officers of the Association. The officers of the company shall suspend said employee at once without pay until such time as the Association shall request his reinstatement.

Section 8.—Any member of Division No. ...., elected or appointed to office in this Division or the International Association, shall, upon his retirement from said office, have his respective place in the company's employ again.

Section 9.—That all motormen and conductors shall be members of this Association and must be turned in for initiation within sixty (60) days from the time they were hired. When men are put on to practice they shall take out a permit card from the Association paying the Association the compensation of one dollar (\$1.00) for same.

Section 10.—From eight (8) to ten and a half (10 1/2) consecutive hours shall constitute a day's work on all regular passenger runs. All motormen and conductors shall receive one-half pay for all necessary dead-heading, and when men are called upon to do any work they shall be paid from the time they have been instructed to report, and must in all cases be paid from said time until they are relieved or their cars are in the car house. No order to report for duty shall be considered as less than one (1) hour of service. No regular man shall be required to do any extra work when an extra is available and should he be able to secure substitute he shall be allowed to do so.

Section 11.—Motormen and conductors on regular cars that are derailed, disabled or delayed in any way shall be allowed to work the number of consecutive hours their run calls for, and if over-time is worked they shall be allowed pay for same at schedule rate.

Section 12.—All motormen and conductors shall have their respective places on their respective lines on the board in accordance with the time they were hired, it being understood that this is to have effect on all men hired in the future. The present list to remain as it is. Motormen and conductors to have the preference of regular passenger and freight runs according to said list.

Section 13.—That all cars running over any line owned, operated or managed by this company shall be manned by members of Division No. ...., who shall have their place on said cars in accordance with their age in the service on their respective lines as provided for in this agreement.

Section 14.—All runs of less than eight (8) hours shall be considered extra runs. First extra to have the preferred run open to him each day and so on through the list, and that the board be marked up at the time the last day run gets off. If the time-table is so arranged that there is a greater number of runs of eight (8) hours or more on Saturday and Sunday they shall be considered extra runs. Runs of the greater number of hours to be preferred runs regardless of starting point. Runs of an equal number of hours and the same starting point, the ones starting first to be preferred. (Many details for local conditions are inserted here.)

Section 15.—All bulletins issued by the officers of the company relative to the duties of the motormen and conductors shall be posted at all starting points, or each man shall be furnished a printed copy.

Section 16.—Motormen and conductors on city lines shall be paid (many details are inserted here.)

Section 17.—This agreement and provision thereof shall continue in force and be binding upon the respective parties hereto until one year from date.

..... Railway.  
By ..... President.  
Seal.  
..... Secretary.  
Seal. For the Association,  
By ..... President.  
..... Secretary.

## The Columbus Shop Improvements.

The Southwest System of the Pennsylvania Lines West of Pittsburgh at present comprises over 1,600 miles, and has an equipment of 556 locomotives, 489 passenger cars, and 20,000 freight and miscellaneous cars. For the current year some 42 locomotives, all heavy ones, will be added, making a total of 598 at the end of 1903. The shops are located at Dennison and Columbus, Ohio, and Indianapolis and Logansport, Ind., the largest of which are at Columbus. Here are cared for the locomotives from the Indianapolis and Cincinnati divisions and practically all of the passenger cars from the entire Southwest System, in addition to which a number of cars, principally passenger, are built annually.

The Columbus shops were built in 1883. In the old erecting shop there are but 11 pits, without crane facilities; yet despite this very serious handicap there were put through the shops last year 420 locomotives—an average of 35 a month.

Enlargement was decided on in 1901, and in December of that year upwards of half a million dollars was appropriated for the purpose. The most important items in the list of improvements were a new engine house, central power station, erecting shop, and locomotive coaling and ash-handling plants. Other items were the extension of the passenger car paint shop, blacksmith shop, and machine shop, and re-arrangement of the power and tools for the latter; new oil, sand and paint storage houses; re-arrangement of yards and tracks, and such minor changes and additions as usually accompany such improvements.

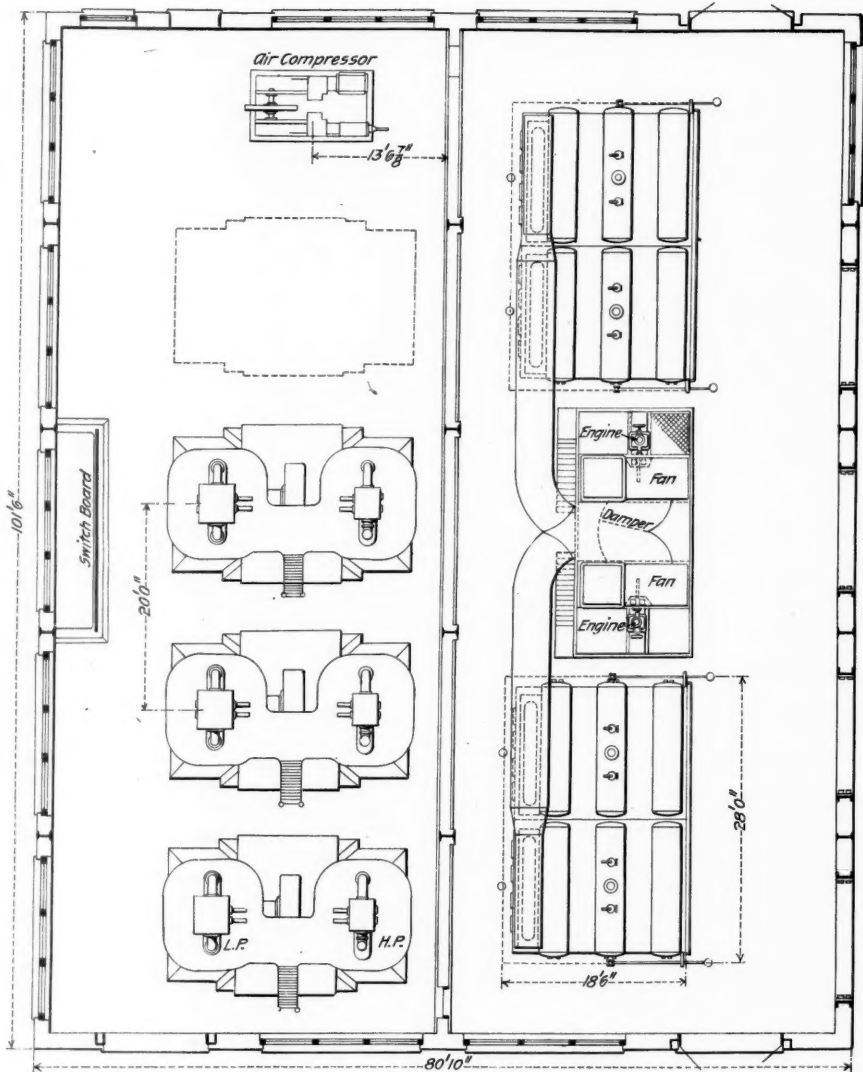
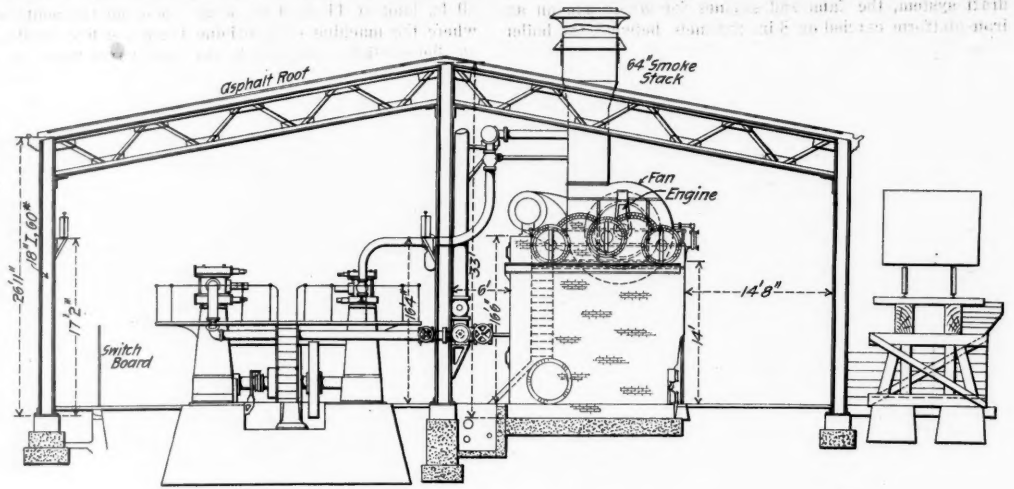
The chief difficulty lay in the necessity for building the new structures partly or entirely over the old without interfering with the operation of the different departments to the extent of seriously curtailing their work. In the case of the roundhouse the new building was built directly on the site of the old and a new and larger turntable was put in. In making the change from the old to the new table only five hours of table service were lost. The old power station stood on the line of the south wall of the new erecting shop, near the east end. The new structure was built over and around the old building, the operation of the power plant continuing until the new power house had been completed and the boilers installed. The steam load was then transferred to the latter and the old station equipment removed to temporary quarters without loss of time to the plant.

The Columbus shops were fortunate in having ample room in which to expand. The only addition in the way of real estate was the purchase of a narrow strip beginning northwest of the new erecting shop and running southwest and west to St. Clair avenue. This was to provide for the increased diameter of the roundhouse, to give a site for the coal wharf, and to permit a satisfactory track arrangement for the coal wharf and ash lift, and for in and out tracks for the roundhouse.

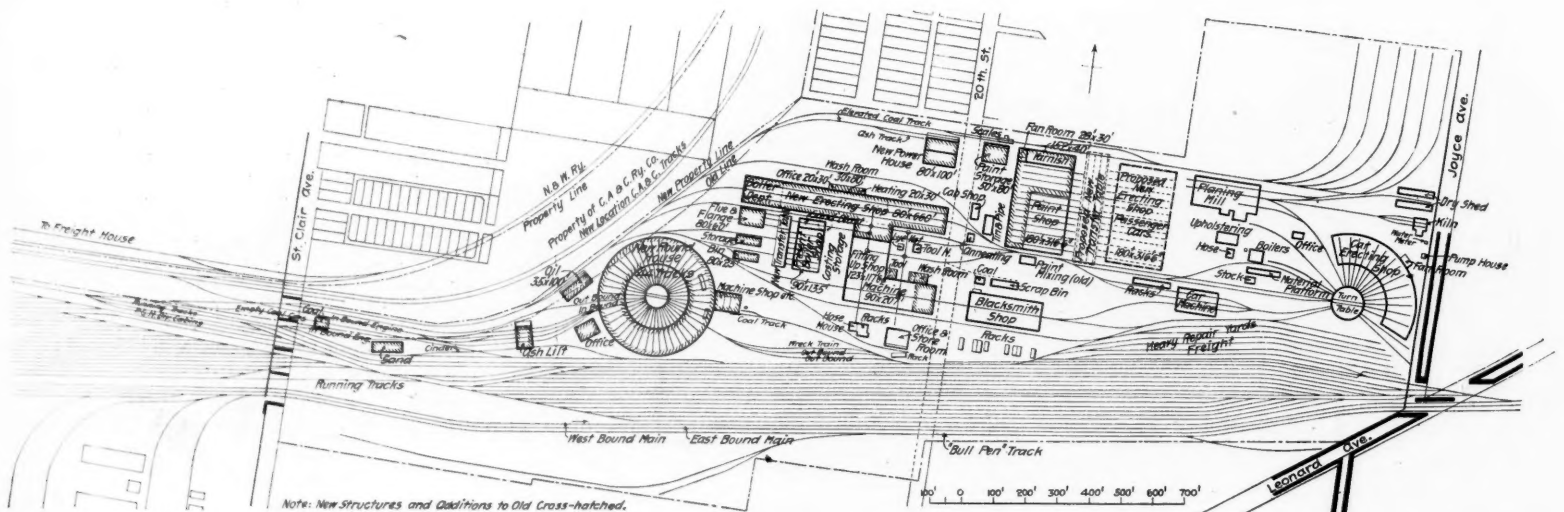
The layout is such that future extensions may readily be made. The erecting shop, for example, may be extended from the west end at right angles, or southward, and then eastward to juncture with the machine shop, with space between for enlargement of the machine department. A proposed new passenger car erecting shop is shown opposite the car paint shop, with transfer table between. The buildings have been so located that should a viaduct ever be built across the property at Twentieth street (just east of the power station and erecting shop) there will be no interference. The new buildings are of brick and steel construction on concrete foundations. The extensions of existing buildings each follows the same construction as the building to which it is added. The soil conditions are favorable for moderate foundation depths.

The power house is 81 ft. 6 in. x 101 ft. 6 in. outside, and is partitioned transversely into two rooms of equal size, 40 ft. x 100 ft. inside. It is of simple though substantial design. The low-pitch roof rests on light Warren trusses, carried upon 18-in., 60-lb. I-beam columns, both in the side and partition walls. The height from concrete foundation to top of partition wall is 33 ft. The roof is asphalt laid over 2-in. sheathing resting on 6 x 8-in. wooden rafters spaced 4 ft. centers.

The boiler plant comprises four 300 h.p. Stirling water.



Plan and Cross Section of Power House, Columbus Shops.



General Layout of Columbus, Ohio, Shops, Pennsylvania Lines West.



tube units supplying steam at 155 lbs. gage pressure, and set in pairs. They are equipped with an induced draft system, the fans and engines for which are on an iron platform carried on 8-in. channels, between the boiler sets. Feed-water heaters are used, which are guaranteed to heat the supply to 210 deg. F.; a filtering and purifying system is used in conjunction with the heaters, supplying treated water to the boilers. The arrangement of heaters, pumps, draft, piping, etc., is such that any heater and any one or more of the boilers may be withdrawn from service, for washing out or other work.

There are no special coal and ash handling facilities. Coal is delivered in cars upon an elevated track on the north side of the building. The space beneath the track is boarded up, the coal being dumped into this enclosure, and drawn into the boiler room as it is needed. Consideration was given to future extension of the power house, and with enlargement of the boiler plant the intention is to put in automatic stokers and overhead coal pockets, with conveyors.

The live steam header is supported from brackets on the steel columns of the partition wall and from the roof trusses. The engine connections are made from the bottom of the line, dropping down below the level of the engine room crane runway before passing through the partition wall. Separators are placed in the lines just inside of the engine room.

There are three generating units composed of Ball & Wood 500-h.p., vertical, cross-compound, non-condensing engines, running at 200 r.p.m., direct-connected to Westinghouse 300-k.w., 250-volt generators. Space is provided for an additional unit. The air compressor is an Ingersoll-Sergeant compound, two-stage unit, with a capacity of 530 cu. ft. of free air per minute, delivering at 100 lbs. pressure; an additional Ingersoll-Sergeant 250-ft. electrically driven compressor is to be installed at the car machine shop, for furnishing air to the car department.

The exhaust connections pass directly under the engine platforms to an exhaust header in the boiler room supported on brackets on the partition wall. Connections from this header are made through the feed-water heaters and thence through a back-pressure valve to free exhaust through the roof; and also to the pipe system leading to the heating plants of the buildings equipped with the hot blast system. This pipe line, together with the line carrying live steam to supplement the supply of exhaust steam in the heater coils when necessary, is placed in a concrete-lined trench back of the boilers, which leads out to the buildings above-mentioned.

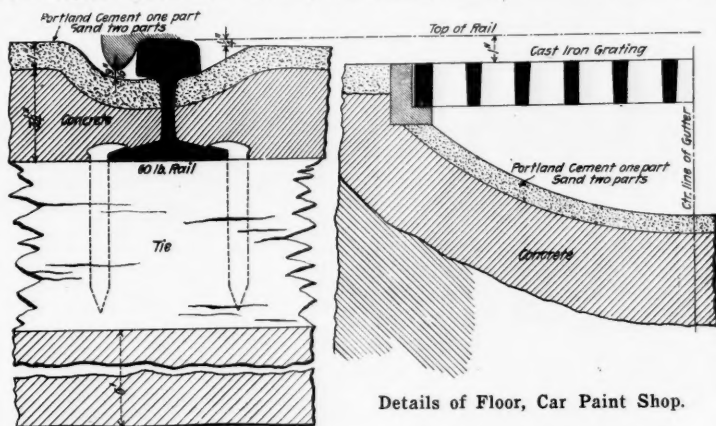
The switchboard is made of 2-in. Tennessee pink

The ridge roll and gutters are 16-oz. copper. In each side of the roof next to the ridge there are 11 skylights, 19 ft. long by 11 ft. 4 in. wide. Also on the south side where the machine shop adjoins there are five additional smaller skylights, situated in the third panel from the top of the truss. In the side and end walls there are double rows of windows, providing ample daylight. All windows have cast-iron sills, and the upper row and also the top sashes of the lower row, which is three-sash high, are operated by Hitching's patent device. Traveling the full length of the shop and having a span of 76 ft. 4 in. are two 75-ton cranes with two 15-ton auxiliary hoists on each crane, furnished by the Shaw Electric Crane Co.

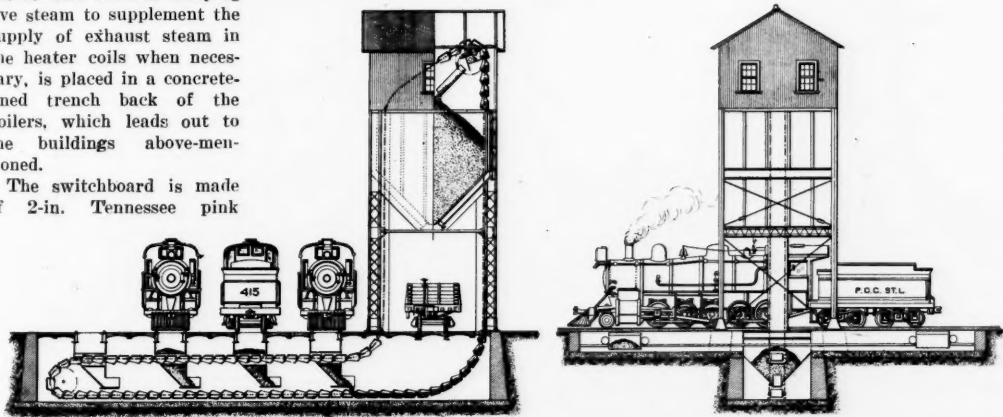
The floor foundation is 8 in. of broken stone laid on the natural soil well tamped. Above this is 6 in. of concrete, the whole being laid over with 1½ in. of asphalt. The pits, which are under the side tracks, are concrete, sides and bottom. Their continuity is broken about midway by a transverse hot-air duct, over which the track is supported by steel rails laid base up, four on each side and bedded in concrete. Upon the rails is a 10 in. x 18-in. white-oak sleeper to which the track rail is fastened by ¾-in. lag screws.

There is track room in the erecting shop for 26 to 28 large engines, or 38 to 40 small engines. The old erecting shop could accommodate but 11 engines.

The old machine and erecting shop is being converted into a machine shop and fitting-up shop. The building has been extended north 54 ft., to connection with the erecting shop, and the east wing has been extended 61 ft. 6 in. This gives a machine department 90 ft. x 207 ft., and a fitting-up department 123 ft. x 117 ft. 6½ in. There have also been added to the north side of the east wing a lean-to 31 ft. 1 in. x 62 ft. 7 in. for fan room, lavatory and lockers, and a tool room 41 ft. x 36 ft.



Details of Floor, Car Paint Shop.



Cinder Dumping Station, Columbus, Ohio.

marble. It rests on a 12 ft. x 2½ ft. plain slate base mounted on 2 x 4-in. angles resting on a concrete foundation. The leads from the generators are lead-covered, paper-insulated cables which pass under the board and up to connection with the bus bars on its back. One feature of the board is the absence of switches for the light and power circuits. Circuit-breakers of the laminated type, having independently operated arm, are made to do duty for switches. The new erecting shop is 80 ft. x 660 ft., with a clear height to truss of 40 ft. The west end of the building, for 125 ft., is to be used as a boiler shop, the rest being entirely for erecting. It is a longitudinal-track shop, there being three tracks spaced 22 ft. 6 in. centers, and running the length of the building. The shop may be entered on the center track from either end. On the north side of the building about midway is a lean-to, 30 ft. x 120 ft., for office of the foreman, locker and wash room, closets and fan room, and also a room for the workmen to congregate in at the noon hour.

The foundations are concrete, the greatest depth of which is 8 ft. below the floor line, or about 7 ft. 6 in. below grade. This depth is for the piers under the columns. These piers support both the crane-runway columns and the truss columns and are spaced 20 ft. center to center. On the south side at the west end a column has been left out, providing for the future extension already referred to. The brick walls are 18 in. thick. The roof is 2¼-in. sheathing, tar felt and slate, laid in the order named on 5¼ in. x 7¾-in. yellow pine rafters secured to the I-beam purlins with Streeter's patent clips.

The construction of the extensions is the same as that of the original building, a cross-section of the machine shop being shown. The width of 90 ft. between wall centers is spanned by a single wooden truss, with 20 ft. clear height to the bottom chord. There have been added a double row of 12-in. I-beam columns to carry the girders for a 10-ton crane traveling the length of the shop. The girders are carried on brackets secured to the columns, the height to top of rail on runway being 13 ft. 6 in. The span of crane is 37 ft. 6 in. The floor of the machine and fitting-up shops is the same as in the erecting shop, viz., 8 in. of broken stone, 6 in. of concrete, and 1½ in. of asphalt. The openings between the tool room and machine shop other than the door and tool windows are closed with heavy wire netting to within 48 in. of the floor.

The machinery department was already well supplied with up-to-date equipment. This will be entirely rearranged and re-distributed. The heavy tools will be ranged along each side of the center for crane service. The shops at present are driven by shafting. The new arrangement provides for electrical driving by individual motors or by the group system, depending on the size of the tools.

The old erecting shop was in the west side of the machine shop, and serving it was a transfer table in the space now marked "Casting Storage." It is the intention to shorten and move this transfer table to the west side of the present boiler shop, which will be used for repairs to tanks, cabs, pilots, etc. A new flue and flange shop, 60 ft. x 80 ft., has been put up south of the west end of the erecting shop. South of this there are two new storage bins, 25 ft. x 80 ft., for boiler shop supplies. They are of corrugated iron with sheet-iron doors, making them fireproof.

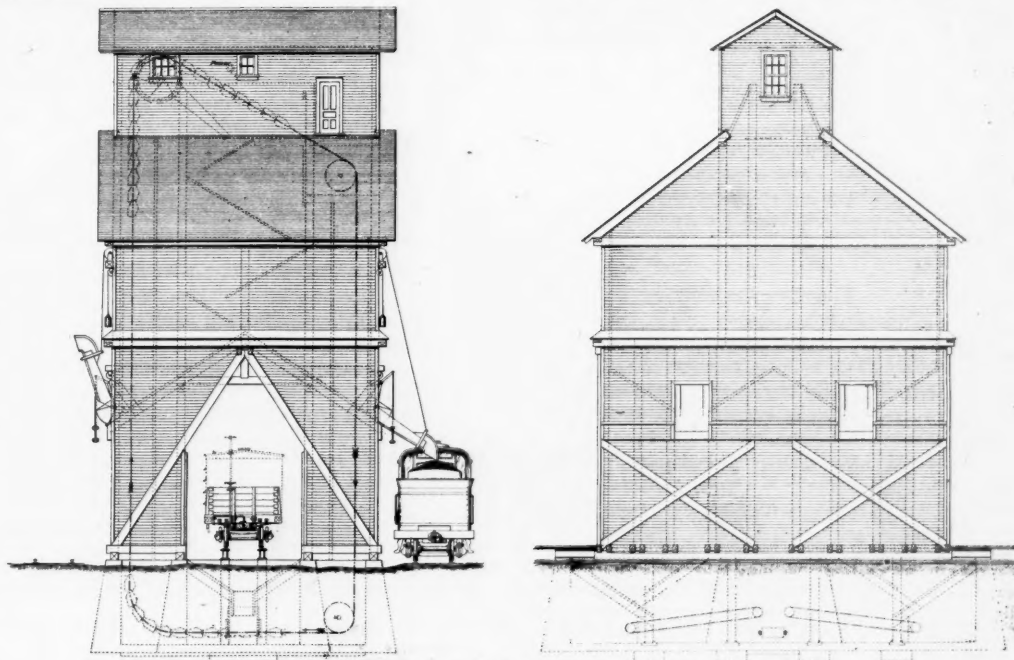
The old passenger car paint shop, which had room for 16 short coaches, has been enlarged to a capacity of 28 long coaches, the building being now 180 ft. x 316 ft. 6 in. It is a brick and timber structure with low-pitch roof, and transverse monitor skylights above every other space between tracks. The height of wall to rafters is 19 ft. 4 in. The latter rest on 12 in. x 12 in. timber posts spaced 31 ft. 10½ in. in the old part, and 25 ft. 2½ in. in the new part. The skylight sashes are operated by Hitching's device.

The floor is cement 1 in. thick on a 3¼ in. foundation of concrete. On each side of each track running the width of the building, is a gutter with rounded bottom forming a depression in the floor 5½ in. deep and 20½ in. wide. These gutters are covered with a cast-iron grating and are connected at each end with a sewer. A detail of these is shown in the illustrations.

At the north end of the building, partitioned off by a 13-in. brick wall, is the varnish room, 40 ft. wide. At the west end of this room is the fan room of the heating system and the foreman's office, separated from the varnish room and from each other by glass partitions. There are also two wide windows and a door between the foreman's office and the paint shop.

The new roundhouse is 370 ft. 4 in. in diameter, the stalls, of which there are 41, being 85 ft. deep. The old house had 66-ft. stalls. The distance from the turntable to the inside circle is 62 ft. 8 in., which is the amount of standing room for engines outside of the house. The section of the house presented herewith shows it to be different from any design previously used in roundhouses. This design has been adopted as the standard of the Pennsylvania Lines West of Pittsburgh.

The lantern, which is 14 ft. 2 in. center to center of side framing, is placed near the back wall, its center being 21 ft. 7 in. from same. The roof slopes both ways from the lantern, the pitch of the longer slope being 2½ in. to 1 ft. A single steel truss spans the width of the house, leaving the floor space without column obstructions. The height to truss is 17 ft. 6 in. The door openings are 16 ft. 6 in. high and occupy the width between the 9¼ x 12-in. cast-iron columns, spaced 14 ft. 3 in.



Locomotive Coaling Station, Columbus, Ohio.

centers, which support the roof trusses. The walls of the building are brick, and the roof asphalt-gravel over 2½-in. sheathing. In the third panel of the truss from the front of the building, over each space between pits is a skylight 4 ft. wide by 8 ft. 6 in. long.

The pits are 60 ft. long and are graded to slope toward the back of the house for drainage into a sewer. The walls and bottom are concrete, and the bottom is coated with 1 in. of cement. The walls are 18 in. thick except at jacking points, where the thickness is increased to 30 in. But for pits 19 and 20 and 22 to 24 inclusive, the 30-in. thickness is used throughout. A catch-basin is placed at the back end of each pit, from which a 8-in. drain leads to the sewer. The hot-air duct of the heating system runs around the inside wall of the house and 15-in. vents controlled by dampers discharge the air into the ends of the pits. Running around the outside wall is a trench for air, steam and water pipes. Drop pits are provided both for driving and truck wheels.

The floor is vitrified brick on a 6-in. foundation of concrete, with a 2-in. filling of sand between. The smoke jacks, which are the Bruyn automatic swinging type, pass out through the lantern. All lantern and transom window sashes are operated by Hitching's device. The new 75-ft. turn-table is electrically operated.

On the east side of the building is an annex containing the roundhouse machine shop, store and tool room for the latter, boiler room, fan room, and locker and wash room. The boiler room contains three 125-h.p. horizontal return tubular boilers to furnish steam for the heating system, air compressor and washout pump and for blowing up engines. They also furnish steam for the oil and sand houses and the coal wharf. Coal is delivered to the boilers on an elevated track on the south side of the annex.

The new oil house is just west of the roundhouse. It is a two-story, fire-proof structure, 74 ft. by 29 ft. 6 in. On the first floor are the tank room, waste storage room,

for the various buildings, have been referred to as these buildings were described. In the car paint shop and the machine shop the air is delivered from overhead ducts, while the erecting shop and roundhouse have underground concrete ducts. In the erecting shop the duct is 7 ft. wide by 5 ft. deep where the fans discharge into it. It runs east and west along the north wall, reducing to a section of 20 in. x 16 in. at the extremities. A lateral 6 ft. 8 in. x 4 ft. crosses the shop to connection with branches along the south wall. From the tops of the main ducts connections formed of terra cotta pipe are run to rectangular flues in the building walls between each column, except where openings occur, and from these flues the air is discharged into the shop 30 in. above the floor.

#### Sand Blast Cleaning of Structural Steel.\*

It has often been observed that mill marks made with paint of a very inferior quality have afforded good protection to steel, while other portions, covered with a much better paint, have been much affected by rust, the latter even extending under paint which, for the most part, has still retained its continuity and elastic qualities. The explanation is found in the facts that the mill marks were made when the metal was clean, and that the paint applied subsequently was spread upon the mill scale, rust and grease which had accumulated upon it before the shop work was finished. However excellent may be its qualities, it is absurd to expect any paint to preserve steel to which it is applied, unless the mill scale, rust, dirt and grease have been first removed. This observation applies with equal, or, it may be said, with even greater, force, to the repainting of old structures which have been neglected, and upon which rust and corrosion have proceeded so far that it is impossible to secure good preservation by ordinary methods of cleaning. Having

being issued on Oct. 18, 1870. This appliance, as improved by Mathewson, is still on the market. In this apparatus, a slotted slide, operated by a lever, regulates the quantity of sand introduced into the current of air. This is shown by the sectional drawing, Fig. 1.

In the Paxson-Warren machine, Fig. 2, the feed of the sand is regulated by a revolving piece, or valve, which covers the opening in the bottom of the hopper to the extent desired to let the proper quantity of sand fall through it and into the air pipe.

In the machine patented by J. M. Newhouse, of Columbus, Ohio, shown in Fig. 3, the sand passes from the hopper at the bottom through an annular opening around the end of a nozzle-shaped steel piece, which decreases in its outer circumference toward the end; and, by raising or lowering it, this annular opening may be increased or diminished in size. The distinguishing feature of this appliance is the use of this nozzle as a siphon with its perforations as shown. The small holes permit part of the air which flows through the small pipe and the siphon to escape outwardly through the surrounding sand, thus stirring it up and preventing it from clogging at the opening. A similar siphon, without the perforations, is placed in the air pipe.

Possibly there are other machines, but the writer is not familiar with them. Any of the sand mixers may be made with two chambers, with valves arranged so as to lock the sand through the upper one into the lower one while the sand-blast is in operation.

The greatest merit of the sand-blast is that it removes from the surface of the metal every trace of dirt, scale, rust and grease, and the bright metallic surface is everywhere exposed and perfectly clean. This is an ideal condition to secure the strong adhesion of the paint, so that, as far as it is possible, it will protect the metal. The thoroughness of the cleaning effected by the sand-blast is noted especially upon metal surfaces which have been pitted by rust and corrosion to a considerable degree.

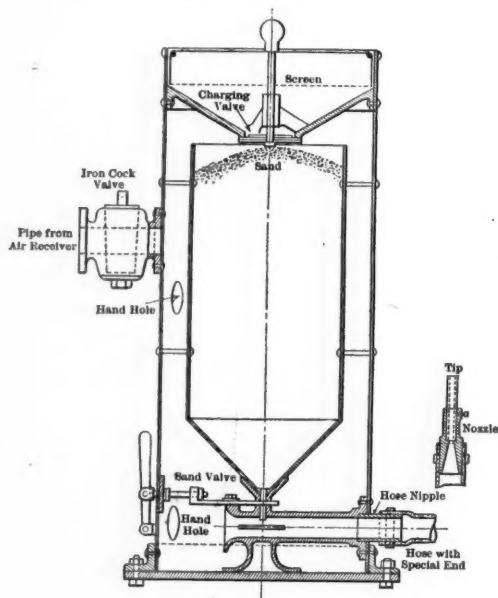


Fig. 1.—Mathewson's Sand Blast (Trade Name, Tilghman.)

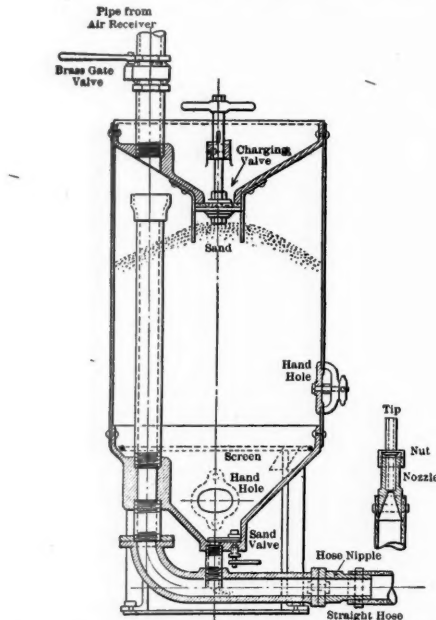


Fig. 2.—Warren's Sand Blast (Trade Name, Paxson-Warren).

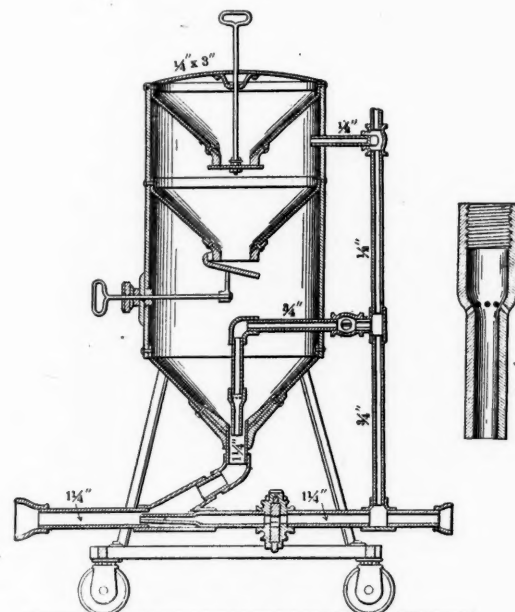


Fig. 3.—The Newhouse Sand Blast.

and supply room, while the second floor is used for an oil storage room. The oil is handled by an air-pressure system, the large tanks in the tank room being filled from the cars by this means. Also the oil is lifted by air pressure to the second floor for filling barrels. In this floor are 11 oil drops, 15 in. x 4 ft. 10½ in., over which barrels may be placed and drained into the tanks below.

The sand house is 90 ft. 5 in. x 35 ft., built of brick. It has three sand stoves and a bin capacity of 700 cu. yds. The dry sand is blown by compressed air into two 30-ton pockets in the coal wharf, from which it may be fed directly to the sand domes of the engines.

The coaling station was put up by the Link-Belt Machinery Co. It has a storage capacity of 800 tons of coal carried in a single pocket facing two tracks, and has four chutes, two on each side, for discharge to tenders. It is electrically operated and the machinery is capable of elevating 100 tons of coal an hour.

The cinder dumping station and ash lift, also Link-Belt, is located 600 ft. from the coaling station. Four engines can be cleaned at one time, dumping both ashpan and front-end. The material is dumped into track hoppers, from which it is discharged into a Link-Belt cinder carrier and deposited in an overhead steel pocket holding two carloads. From this pocket it may be discharged directly into a car below.

For general lighting in the buildings incandescent lamps with glass reflectors are to be used. In the roundhouse these lights will be placed on the rear wall; also between each two pits there will be three overhead lights. The turn-table will be lit by four of the reflector lights affixed to the outside of the inner wall. In the machine shop, in addition to the general lighting by the reflector lights, each tool will have one or more lights, as needed. The shops and yards are to be lighted with enclosed arcs.

The heating of the larger buildings is by the Sturtevant hot-blast system, using exhaust steam. The fan rooms

this knowledge in mind, it is proper to determine, from the conditions met in any case, what is necessary to be done in order to insure that the preservative coating shall be applied only after the surface of the metal is clean and in proper condition to receive it. To accomplish this, there is no doubt that much of the new as well as old steel will be required to be cleaned by means of the sand-blast, as the only practicable and effective method. Much of the steel, after leaving the mills, is stored out-of-doors and exposed to the weather for a considerable length of time before the shop work is done. Thus its rusting often progresses to such an extent that the ordinary process of cleaning with wire brushes, even if that be attempted, is not sufficient to permit the paint to come into immediate contact with and become firmly adherent to the metal. The quality of the paint used, on new structures as well as old, is an important matter; but that cannot be discussed in this paper.

The effectiveness of the sand-blast process depends upon the ability of sand, used as a projectile, to break up, wear away and remove the substances against which it is directed, when actuated by a current of compressed air. All the machines, often called mixers, for the application of this process, are intended to secure the introduction of the proper proportion of sand into a current of compressed air passing through a pipe. This current of compressed air, bearing with it the sand thus introduced, is then directed into and through rubber hose, preferably 2¼ or 2½ in. in diameter, and a steel or iron nozzle of suitable size, and against the surface to be cleaned. Sometimes the air-blast alone may be used to remove dust and soot. Such an appliance was first invented and patented by General Benjamin C. Tilghman, the patent

The pits are thus cleaned as thoroughly as other places. It also reaches and cleans effectually every portion, in re-entrant angles and on the edges of the different sections of a beam, girder or post, on and around rivet heads, and in many other places either entirely inaccessible to the wire-brush or steel scraper, or on which they are used with great difficulty and little effect.

Such places cannot be cleaned thoroughly by hand, even with the most diligent effort. Even plane surfaces of considerable area, on old structures requiring repainting, especially where covered largely with scales and rust, cannot be thus cleaned so as to remove all the dirt, rust, scale and disintegrating paint. There will still remain sufficient rust and scale to separate slightly the paint from the metal, so that there is not the intimate contact and firm adhesion necessary to prevent the rusting process. The continuity of the coat of paint will soon be broken at places, and, moisture and gases in the atmosphere coming in contact with the metal, rust will be formed even under places where the paint remains intact.

Paint applied to such surfaces can often be stripped off like the peel of an orange, and still remains tough and elastic. Good paint, it may be, but it has never taken a good hold on the steel. On the other hand, the writer has seen a piece of old steel, which was cleaned and painted with red lead in 1899, on which the paint will not peel off at all, but may be cut away, still leaving the under portion tightly adhering to the steel.

The sand-blast has been found serviceable and economical for other purposes than the cleaning of steel plates and structural steel. It is used in cleaning iron and brass castings, either by the direct application of the blast, or by introducing the sand-blast through the hollow trunnion of the tumbling barrel in which the castings are placed. The inner, as well as the outer, surfaces of castings are thus cleaned, and the sharp lines of the edges preserved, while the cleaning effected by the tumbling

\*Extracts from a paper presented before the American Society of Civil Engineers, March 18, by George W. Lilly, Assoc. M. Am. Soc. C. E.



barrel without the sand-blast tends to round off the corners. Its use to clean street railroad rails and fish-plates, for cast and electric welding, is familiar to all. It is also quite effective in cleaning cut-stone work. One of the ice-manufacturing companies of Columbus, Ohio, has recently purchased a sand-blast machine for use in removing from its condenser pipes the lime scale formed from the hard water used.

The Columbus Railway Company has made use of it in cleaning about 18 in. in length of a large number of its iron trolley poles, just above and below the surface of the ground. At this point the poles had rusted to such an extent as to weaken them materially, and it would soon have been necessary to replace many of them. After cleaning in this way, a coat of paint was immediately applied, and, soon afterward, each pole was encased in a cylinder of cement mortar tamped into removable forms.

The sand-blast has also been used at the shops of the Pittsburgh, Cincinnati, Chicago & St. Louis, and in other railroad shops, in cleaning the tenders of locomotives before repainting. A great saving of expense is thus realized, and superior work is obtained. It would be attempting too much to take up the methods and relative costs in these various lines of sand-blast work.

It seems that, beyond a few scattered experiments, only during the past six or seven years may be found any published record of the application of this process to the cleaning of structural steel. And, even in these recent years, no very great amount of such cleaning has been done. Most of the trials heretofore made have been upon a somewhat experimental basis, and yet something may be learned from them. It is still rather problematical as to how cheaply the mill scale, rust and grease could be cleaned from new steel plates and structural steel, if an efficient permanent plant were provided for the purpose. Some new plates for the bilge keels of the "Massachusetts" were cleaned at the United States Navy Yard, Brooklyn, in April, 1897. With one nozzle, 3,155 sq. ft. of surface were cleaned in 11 hours. This is at the rate of 286.8 sq. ft. per hour. The cost of the work was 0.56 cent per sq. ft. Upon this basis the writer estimated that the sand-blast cleaning of new steel plates, I-beams and other sections, would cost from 50 cents per ton, for very heavy sections, to \$1.75 per ton, for light sections. This would not be a very large additional expenditure upon steel structures, considering the longer life which it would, no doubt, insure for the steel thus treated. The rapid deterioration and wasting away which has been observed on bridges and other structures may well cause builders of steel-framed buildings to consider the advisability of cleaning the steel in this way, before painting it and hiding it from inspection in the walls. The safety as well as the durability of such buildings may depend upon better provision against the rusting out of these steel frames. Who knows?

Much of the expense of repainting in the future would be saved if greater care were taken in securing thorough cleaning at the shops before applying the first coat of paint to new work. If this is to be accomplished, it will in many cases be found necessary to use the sand-blast; but this will not be done until the purchaser is willing to pay for it; and he must be convinced of its necessity and ultimate economy before he will be willing to do so. When there is a demand for it, the shops will be equipped with the necessary machinery, and will be able to do it more cheaply. At present, one shop has to bid against the other, and none of them being required to make bids with such cleaning as a part of the specifications, the bids are such that the shops probably cannot afford to clean the steel properly, in some instances at least. They are averse to this process because of the expense of fitting up for it, the delay in getting the work out, and the cost of handling. Therefore the purchaser must be the prime mover in securing such work.

In the cleaning of old structures for repainting, this process has been more extensively applied, and, therefore, there are better data relative to such work than as to the cost of cleaning new steel at the shops. The work done on the 155th street viaduct, in New York City, under the direction of E. P. North, M. Am. Soc. C. E., Consulting Engineer, during the year 1897, is familiar to all. The cost of this work was reported as averaging about 13 cents per sq. ft., ranging from 20 cts. at the first, down to a little less than 10 cts., in the latter part of the work of cleaning 50,000 sq. ft. of surface. The pressure of compressed air then used was only about 20 lbs. at the sand-blast apparatus, which is without doubt too low a pressure for the efficient removal of scale such as had accumulated there. It would seem, from recent experience, that a pressure of 35 lbs. would have been much more effective. This is true, because the viaduct was covered to a considerable extent with heavy rust scale and four layers of old paint, and a pressure of 35 lbs. would have made the sand projectiles much more efficient in breaking up and throwing off such scale. M. E. Evans, Assoc. M. Am. Soc. C. E., who was in immediate charge, estimated that the 600,000 sq. ft. of the painting surface of the viaduct could be cleaned for about 7.5 cents per sq. ft. It is quite probable that this could be done now at half that estimate, at least on all portions of the viaduct except the members having a very small extent of surface, where much sand and air are wasted in missing the steel along the edges.

During the year 1899 the Pittsburgh, Cincinnati, Chicago & St. Louis used the sand-blast for cleaning the columns and girders supporting its buildings over the railroad tracks, along the east side of the High street viaduct, in Columbus, Ohio. The girders support brick

arches, and there are no buckle plates. They are subjected to the blast, gases and steam from the large number of locomotives passing to and from the Union Depot, and freight and switch engines passing under them at frequent intervals. This company also cleaned part or all of a bridge at Akron, Ohio. No accurate account was kept of the cost and the area cleaned; but, from the best available information, it is estimated to have been about 3 cents per sq. ft. J. M. Newhouse, the inventor and patentee of the Newhouse sand-blast, is foreman for this company, and his apparatus was used in doing the work.

The City of Columbus, Ohio, has six viaducts in the vicinity of the Union Station, by which the streets pass over the railroad tracks. All the railroads passing through the city, except one, enter and leave the Union Station under the Fourth street viaduct near the east end, and the High street viaduct near the west end; and some of them pass under each of the other viaducts, one to the west and three to the southwest from the High street viaduct. Besides the freight and passenger trains passing under them, much switching is done under each by the yard engines. Hence, all these viaducts have been attacked seriously by rust and corrosion; and, on the portions most exposed to the blast, steam and gases from the locomotives, nearly all the paint has been destroyed and the metal consumed to a considerable extent. The Fourth Street Viaduct has been injured most, and two years ago it was cleaned by hand and repainted. This viaduct was erected in 1891, and was repainted in June, 1894; in September, 1896, and again, at the time above mentioned, in the fall of 1900. When the last repainting was progressing it was found necessary to replace 17 of the 7-in. I-beams supporting the plank floors of the sidewalks over the tracks most used by freight trains and yard engines. At the time this was done, the lower flange-angles of many of the stringers supporting the buckle-plates under the roadway had been rusted away until very thin; and in places the horizontal legs of the angles had been partly eaten away, so as to narrow them to about half their original width. These, however, were still considered of sufficient section to last for a time, and were not replaced then. The viaduct was painted under a contract, and considerable care was taken in trying to clean it as thoroughly as possible with steel scrapers, brushes, chisels and hammers. The hammers were often vigorously used to jar the scales loose by blows against the steel, and then scrapers, chisels and wire brushes used to complete the work.

At that time the sand-blast was suggested by the Engineering Department, but was not used. With as thorough work as could be done, many scales, so tightly cemented to the steel that they could not be detached, were loosened, upon the application of the first coat of paint, by the softening effect of the oil acting upon the cementing rust. The paint then applied began to scale in places within six months thereafter, partly due to the inferior quality of the first coat of paint and partly to the rust, soot and scale left upon the steel when repainted. The flange-angles of the floor stringers continued to waste away, and, in the summer of 1902, it was found necessary to replace the two angles of the lower flange on each of 90 floor stringers.

The new angles were surrounded with a covering of Portland cement mortar, 1 to 2 mixture, about  $\frac{3}{4}$  to 1 in. thick. This was rammed under the lower surface of each beam, between it and a plank form, which was left to hold it against the steel until it had set for 48 hours. A wire netting, four meshes to the inch, secured by sheet-iron fasteners placed on the rivets as they were driven, was placed so as to surround the lower flange-angles before the cement mortar was applied. The cement covers the angles and netting completely, and is expected to protect them from rust. After seven months the cement is still intact, and shows no sign of cracking.

In view of the rapid deterioration of the viaducts of the city, and the prospect of having to replace them in a few years unless something were done to arrest it, the city authorities were induced to adopt the sand-blast as a means of cleaning them before repainting. Julian Griggs, M. Am. Soc. C. E., Chief Engineer of the Department of Public Improvements, had been very earnest in the advocacy of this course, believing it to be the only one that would be effective. Accordingly, in November, 1901, the work was commenced on the Front Street Viaduct, over the Little Miami Railroad, and 12,600 sq. ft. were cleaned and repainted, under the supervision of the writer as engineer in charge. When the weather became suitable for it, in April, 1902, the work was resumed and continued on this and the other viaducts named until the middle of November. The cleaning done amounted, in all, to 135,500 sq. ft. of surface. Four viaducts and the south span of the High Street Viaduct were completed. It is likely that the other three spans of the High Street Viaduct, and the Fourth Street Viaduct, will be cleaned and repainted during the coming season of 1903.

The sand, in passing from the large sand hose to the small nozzle, is deflected so as to produce a cross-fire, striking with greatest force against the sides of the small pipe near the reducer end. A like wear upon the rubber sand hose occurs near its connection with the pipe from the machine, which is a  $\frac{1}{4}$ -in. pipe, and the spreading out of the sand to form the larger stream causes it to strike against the sides and then deflect to follow the direction of the hose.

The nozzlemen should be men of some judgment and intelligence, so that they will understand how to manage the nozzle to make the blast most effective. The helmets

worn at Columbus were of tin, with cloth curtains hanging to the shoulders to keep out the dust, as far as possible. Instead of using wire gauze in the helmet, two pieces of glass were used for the nozzleman to see through, because it excluded the dust more effectively. When frosted over by rebounding sand, the glasses were removed and new ones inserted. After a little experience, a good nozzleman will learn how to hold the nozzle in any given case, varying its distance from the working point according to the manner in which he finds it is operating. Heavy scale requires him to hold the nozzle close, and light cleaning can be done more rapidly by holding it farther away and permitting the blast to spread somewhat and thus cut a wider swath. On moderately hard places about 5 to 6 in. is the proper distance. To make it clean most rapidly he must also direct the blast so as to cut a swath clean as he goes, passing first in one direction and then in the other, across the member being cleaned, so as to leave no spots to which he must go back and thus waste the force of the blast on clean metal around them. The nozzle should generally be directed so as to strike the surface at a slight inclination from the normal, say 20 to 30 deg. away from the nozzleman, thus blowing the dust and sand away. The cleaning should be carried forward from the nozzlemen, so that the blast will always act upon the exposed edge of scales, rust, or old paint, and, by getting under any loose portions, throw them off without first having to break them up.

The compressed air was supplied by the Union Depot Co., from a compressor with an air cylinder of 14 in. diameter and a stroke of 12 in., compressing the air to a gage pressure of 50 to 60 lbs. The number of strokes was regulated automatically so as to keep the pressure nearly constant. The air was led from the compressor to a large receiver, and then, by a line of 2-in. steel pipe, to a small receiver at the viaduct where the work was to be done. From this receiver (having a capacity of about  $9\frac{1}{2}$  cu. ft.) the air was conducted to the sand-blast machines. The pressure at the machines was usually from 30 to 40 lbs. The requisite length of 2-in. pipe varied from about 1,250 to 2,200 ft. The small receiver had a pet-cock in the bottom to let out accumulated water, and it removed much of the moisture from the air used.

From the experience in sand-blast cleaning here given it may be stated safely that, for heavy scale and corrosion, a pressure of from 35 to 45 lbs. per sq. in. is not any too high. On the other hand, very efficient work is done at a pressure of about 25 lbs., where only light scale, rust spots and disintegrating paint are to be cleaned off. The labor costs approximately twice as much as the power, and increase of power is advisable where needed.

On all the cleaning done, the bright surface of the steel, having almost the appearance of frosted silver, was exposed to view by the removal of every vestige of rust, scale and old paint. The pitted portions, with a little more brushing, were as well covered with the paint as the others, and, after one year, it still holds on them as firmly, to all appearances, as when it first dried, after being put on.

The paint was applied very soon after the sand-blast, and sometimes curtains of heavy muslin were stretched between the painters and the sand-blast to prevent the dust and sand from interfering with the painting. All surfaces cleaned were painted before night, and rarely was it necessary for the painters to work more than half an hour after the sand-blast was discontinued for the day. It is best to work with the wind, so that it will carry the dust and sand away from the painters and nozzlemen.

A nozzle made from three  $\frac{1}{4}$ -in. gas pipes, one end of each being inserted in a  $1\frac{1}{4}$  x 1-in. bushing, and babbitt metal poured in to secure them there, while only made for an experiment, gave very good results, with the highest rate of cleaning, in square feet per hour. It used considerable sand, about the same as the  $\frac{3}{4}$ -in. pipe, but cleaned nearly one-half more. The other nozzles were 12 in. long. The  $\frac{1}{2}$ -in. extra heavy pipe, which is  $\frac{3}{4}$  in. when worn out, is about the proper size for this kind of work.

Improvements can certainly be made in this apparatus. Some of the appliances were made as experiments, and are rather crude. More sand-blasts might be added with advantage, if sufficient power to run them were provided. (The work at Columbus was limited to two machines, on account of the small capacity of the compressor.) Perhaps a larger pipe to convey the air would have added to the pressure at the machines, and to the effectiveness of the sand-blast. For ordinary cleaning of bridges and other structures, not subjected to such hard treatment as viaducts situated where much exposed to the blast and gases from locomotives, it is safe to say that, with a more perfect equipment, sand-blast cleaning can be done at from  $1\frac{1}{4}$  to 2 cents per sq. ft. The advantages anticipated for this kind of cleaning, especially where almost a necessity, because nothing else will do the work thoroughly, are to be gained by a careful inspection at intervals after it is done, and the repainting, with ordinary, good hand-cleaning, before the paint has been worn off so as to set up the vigorous rusting process which comes when air and moisture get to the metal. In such locations as the viaducts in Columbus it seems to be the only thing that will do the work. For future construction in similar locations let every engineer beware of the use of steel exposed to locomotive blasts, as these will wear out any paint. The life of those structures already in existence, and others which may be built in the future, should be extended as long as possible by the use of the best means that can be commanded.



## The Mohan Ticket.

Mr. J. E. Mohan, stationer of the Michigan Central, at Detroit, Mich., has designed "the Mohan simple ticket," by the use of which book and card tickets for local points may be done away with. One form of this ticket will take the place of 50 or more card forms. It is what might be termed a double headed ticket. A contract coupon is printed at each end. Between these, in duplicate columns, the stations are shown in geographical order; those in one column being arranged one line below those in the opposite column. Station numbers are also printed opposite the names of the stations. The direction of the station from the issuing point, as geographically grouped, is indicated in each coupon, and at the top of one and at the bottom of the second column, north, south, east or west, as the case may be. In the selling of the ticket it is cut horizontally at the destination point, with a straight edge cutter.

| ADVANCE R. R. CO.                |                                  |
|----------------------------------|----------------------------------|
| GOING EAST                       | GOING WEST                       |
| Good for One First Class Passage | Good for One First Class Passage |
| SPRINGFIELD, MASS.               | SPRINGFIELD, MASS.               |
| TO LAST STATION NAMED IN MARGIN  | TO LAST STATION NAMED IN MARGIN  |
| Form A.A.                        | Form A.A.                        |
| GOING EAST                       | GOING WEST                       |
| 1 Boston                         | 100 Northampton                  |
| 2 Worcester                      | 101 Northampton                  |
| 3 Springfield                    | 102 Northampton                  |
| 4 Holyoke                        | 103 Northampton                  |
| 5 South Hadley                   | 104 Northampton                  |
| 6 Westfield                      | 105 Northampton                  |
| 7 Northampton                    | 106 Northampton                  |
| 8 Westfield                      | 107 Northampton                  |
| 9 South Hadley                   | 108 Northampton                  |
| 10 Worcester                     | 109 Northampton                  |
| 11 Springfield                   | 110 Northampton                  |
| 12 Holyoke                       | 111 Northampton                  |
| 13 South Hadley                  | 112 Northampton                  |
| 14 Westfield                     | 113 Northampton                  |
| 15 Northampton                   | 114 Northampton                  |
| 16 Springfield                   | 115 Northampton                  |
| 17 Worcester                     | 116 Northampton                  |
| 18 Boston                        | 117 Northampton                  |
| 19 Northampton                   | 118 Northampton                  |
| 20 Springfield                   | 119 Northampton                  |
| 21 Worcester                     | 120 Northampton                  |
| 22 Boston                        | 121 Northampton                  |
| 23 Northampton                   | 122 Northampton                  |
| 24 Springfield                   | 123 Northampton                  |
| 25 Worcester                     | 124 Northampton                  |
| 26 Boston                        | 125 Northampton                  |
| 27 Northampton                   | 126 Northampton                  |
| 28 Springfield                   | 127 Northampton                  |
| 29 Worcester                     | 128 Northampton                  |
| 30 Boston                        | 129 Northampton                  |
| 31 Northampton                   | 130 Northampton                  |
| 32 Springfield                   | 131 Northampton                  |
| 33 Worcester                     | 132 Northampton                  |
| 34 Boston                        | 133 Northampton                  |
| 35 Northampton                   | 134 Northampton                  |
| 36 Springfield                   | 135 Northampton                  |
| 37 Worcester                     | 136 Northampton                  |
| 38 Boston                        | 137 Northampton                  |
| 39 Northampton                   | 138 Northampton                  |
| 40 Springfield                   | 139 Northampton                  |
| 41 Worcester                     | 140 Northampton                  |
| 42 Boston                        | 141 Northampton                  |
| 43 Northampton                   | 142 Northampton                  |
| 44 Springfield                   | 143 Northampton                  |
| 45 Worcester                     | 144 Northampton                  |
| 46 Boston                        | 145 Northampton                  |
| 47 Northampton                   | 146 Northampton                  |
| 48 Springfield                   | 147 Northampton                  |
| 49 Worcester                     | 148 Northampton                  |
| 50 Boston                        | 149 Northampton                  |
| 51 Northampton                   | 150 Northampton                  |

Thus cut a complete ticket from the issuing station (name printed in the contract coupon) to the last station named in margin is produced, without the use of pen or ink. That portion of the ticket reading in the opposite direction, but which by the grouping of the stations also shows the destination to which it is cut, is held by the agent as a stub. On the round trip form it is necessary to fill in the number of the station to which sold on the going coupon only, with the pen, but as the return portion of the ticket shows the printed destination, this feature does not weaken the safeguard against manipulation. The round trip form can be issued very quickly.

The cutter is of simple form. It consists of a soft metal base with beveled edge surmounted in the center by a thin steel cutter  $\frac{3}{4}$  of an inch wide, securely fastened, and with a back-stop guide. This cutter is fastened to the ticket counter. The ticket and cutter have now been in use on the Detroit Southern Railway for several months, and Mr. Geo.

M. Henry, General Passenger Agent of that line, says that he has been unable to detect any imperfections. The ticket gives satisfaction, both to the issuing agent, the conductor and the accounting department. The tickets can be printed bearing the station name or reading from "Blank," according to the importance of the station using them. They can be issued to the most remote point on the line. The destination cannot be raised or altered. For every sale the agent has a stub.

They are not complicated to report, since the Accounting Department instructs agents to report the actual number sold, for example: 15 to Adrian, 25 to Lima, etc., and the commencing and closing numbers are shown once at head of report. The ticket can be issued as quickly as a card ticket, and many times quicker than a book ticket.

## Tie Timber.\*

The value of any particular kind of wood for tie purposes has so far depended largely upon its power to resist decay. The most valuable timbers, like the white oak and the long-leaf pine were used because they lasted longer than other timbers, which meant a saving in the renewal costs great enough to warrant a high first cost. For our purposes we may speak of such woods as high grade, as distinct from such as are short lived like red oak, loblolly pine and hemlock, timbers which it has not hitherto paid to use because of the necessity for frequent renewals. The high-grade timbers are as a rule dense, hard woods, which absorb water slowly, and for this reason, possibly also because of the presence of antiseptic substances, are not as rapidly attacked by wood-destroying fungi. The injection of chemicals into timber does away with this distinction, and sets up another. The longest lived preserved timber (speaking with reference to resistance to decay alone) will be the one which will allow of the most perfect and even penetration of a preservative, and which at the same time will hold such a preservative. But we not only want long life, but also want a timber which with any given treatment will bring an increased length of life which shall represent the greatest possible financial return on the original investment, made up of the first cost of the timber and the cost of the preservative process. It so happens that the open-grained porous woods which, when untreated, last but a comparatively short time, give high penetration and comparatively long increase in length of life, while the denser

woods which ordinarily are called long-lived, give a poor penetration and comparatively short increase in the length of life as a result of preservation. The two classes of untreated woods are therefore reversed when it comes to preserved timbers.

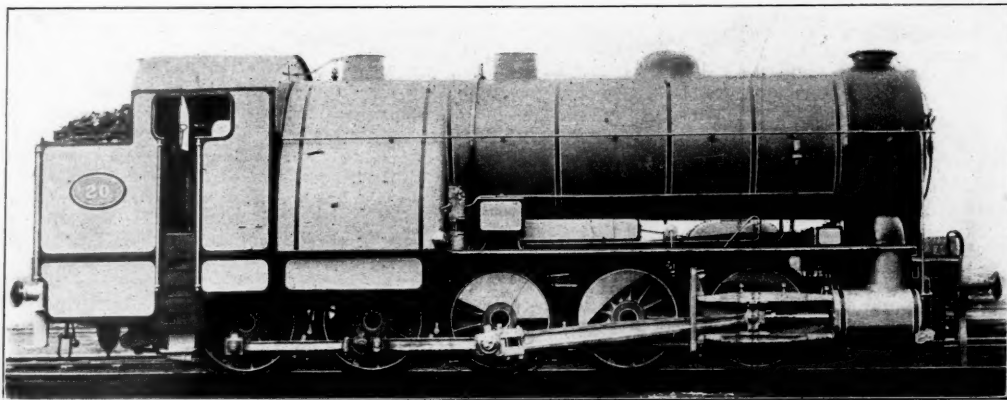
Untreated oak gave the French Eastern Railroad an average length of life of 20 years. The treatment added five years to this. Untreated beech lasts about 4 or 5 years in Europe, while the treated beech has so far given an average life considerably over 35 years. The extra amount of preservation put into the porous beech was repaid many times by the increased service obtained from this timber.

The conclusions to be drawn from such data are obvious. The short-lived porous timber well treated repays many times the cost of treatment, and when compared with the harder, usually longer-lived wood, the difference in return in favor of the porous beech is so large, that it is no wonder that treated white oak is no longer employed. If we apply this method of reasoning to our native timbers, we will find that there is no reason why we should not get similar results, even if the wood and the preservative are not identical. We may therefore set up this tenet with some confidence: "The wood which ought to be used for ties should be a porous wood and this should be treated with as good a preservative as can be afforded." Porous woods are cheap, for their short life when untreated makes them undesirable. One will therefore be able to pay more for the first cost in the way of preservation for a cheap timber than for an expensive

or boiling in copper-iron aluminum sulphate. There are several new processes which must still show what may be expected of them. Where one can afford to use tar oil, it certainly is without question the best paying preservative. Care should always be taken to use properly seasoned wood and to avoid high temperatures during the impregnating process. The zinc chloride process is probably the best for certain cases, and it certainly gives excellent results provided the treatment is well and carefully done. The combination processes which employ zinc chloride and tar oil have shown excellent results, and they are probably superior to the zinc chloride alone where the timber is placed in wet climates. The Hasselmann treatment, while it has as yet shown no very conclusive results, is so cheap that the risk taken in using it is so small that it ought to be tried. We are now testing several new processes, notably a recent French electrical process, and I have just made arrangements to place large numbers of test ties on a line of the Mexican Central Railroad, where we expect to obtain results in a very short period of time.

## Suburban Locomotive for the Great Eastern of England.

The 10-coupled suburban tank locomotive built by the Great Eastern for handling its heavy passenger traffic out of London was shown in detail and described in the *Railroad Gazette* of Feb. 27, 1903. The accompanying photograph shows the completed engine. The reader is



Ten-Coupled Suburban Tank Locomotive—Great Eastern, England.

timber, i.e., it will pay better to treat a red oak, a hemlock, beech or loblolly pine tie costing 40 cents with a preservative costing 25 to 30 cents, than to use an untreated white oak tie costing 70 cents; or again, it will pay better to treat the hemlock, beech or loblolly pine with a 25 or 30 cent treatment than to treat a white oak costing 60 cents with a 10-cent treatment. Porous timbers come from rapidly growing trees as a rule, which means short periods of rotation of a forest under management, and consequently a definite and sure future supply. And again, these timbers are still plentiful in most localities in the United States, and it will be possible to start forest management and timber preservation at the same time. If we sum up the foregoing we will find that all factors tend to unite in showing the advantage and absolute necessity for using inferior short-lived timbers, which can be treated with a good process. It may be of interest to give a short list of what I have called long and short-lived timbers which enter or may enter as possible sources of ties, poles, posts, etc.:

## Long-lived dense timbers.

White oak,  
Long leaf yellow pine  
Locust,  
Ash.

## Short-lived porous timbers.

Red and swamp oaks,  
Beech,  
Hemlock,  
Loblolly and lodgepole pines,  
Gum,  
Tamarack,  
Fir.

This list is simply a tentative one and there are those (myself included) who would probably add some to both columns.

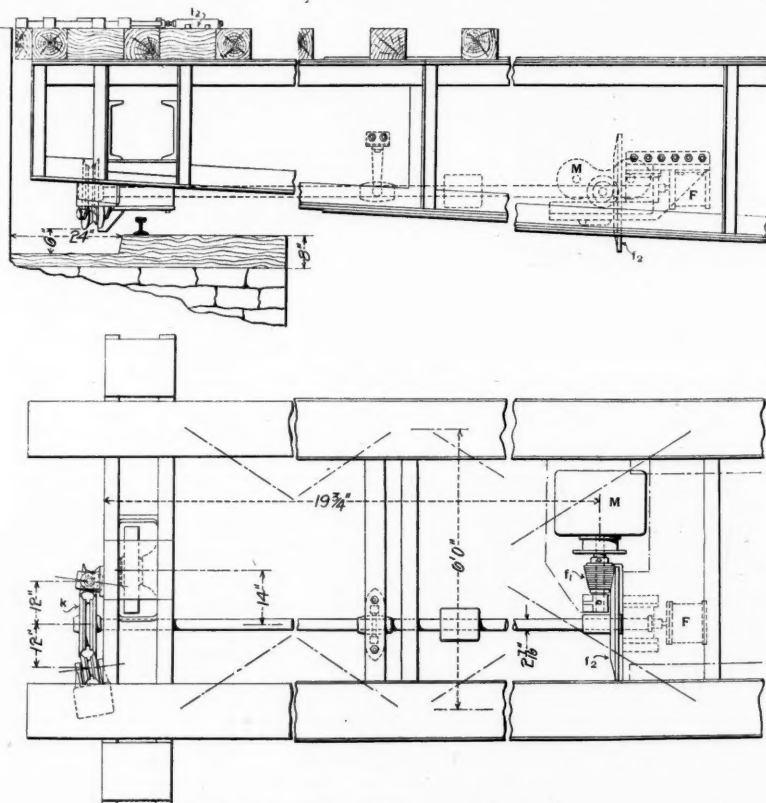
Coming now to the next question: What preserving methods ought to be used? I will say briefly that the choice is very small. It lies between (1) creosoting or tar oil treatment, (2) burnettizing or treatment with zinc chloride, (3) a combined zinc chloride and tar oil treatment in its various forms, (4) the Hasselmann process,

referred to the other descriptions for the details of this engine, but it may be well to restate that the total weight is about 65 long tons and the heating surface is 3,010 sq. ft. The photograph was obtained for us by the editor of *Transport* from the Locomotive Publishing Company, of London.

## Pneumatic Turn-Table.

A high speed compressed air turn-table has recently been installed by the Pennsylvania at the Coal Port engine house, Trenton, N. J. The table is 75 ft. in diameter and was built by the American Bridge Company, Trenton. The machinery was designed and installed by Mr. W. B. Page, Master Mechanic of the Lambertville shops.

Air is admitted to the table through the pivot P, which



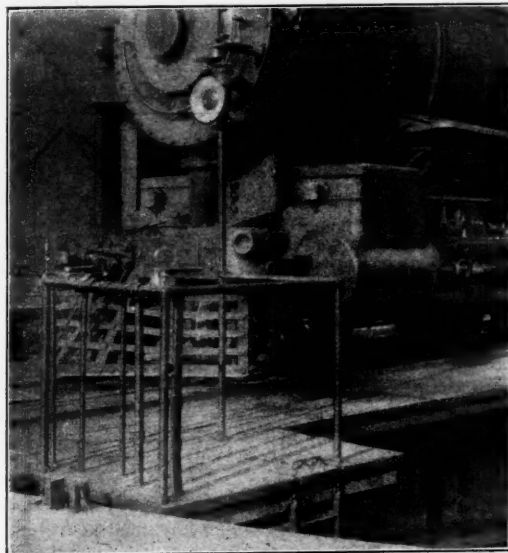
Driving Mechanism—Pneumatic Turn-Table.

\*Extract from a paper by Prof. Hermann Von Schrenck, read before the New York Railroad Club, April 17, 1903.

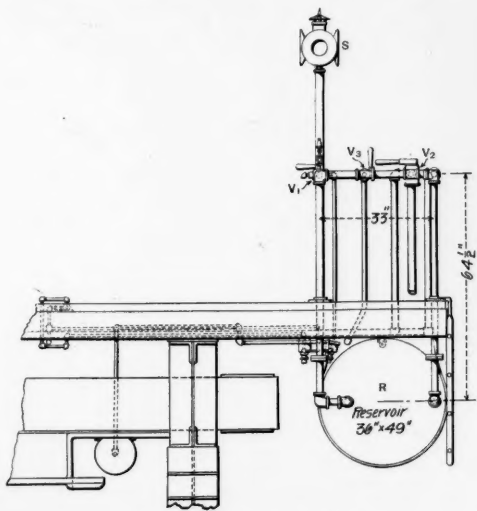


is drilled for the supply pipe p. This pipe ends below the ties, and enters a specially designed right angle stuffing box B, making a flexible connection. The air passes through a check valve c and strainer m to the storage reservoir R, and thence through two hand rail columns to the control valves on the operating platform. The table is driven by a No. 6 Moore reversible crane motor M, acting through two friction wheels  $f_1$ ,  $f_2$ , a sprocket wheel k, and an endless chain, around the outer edge of the pit rail, which depends entirely upon friction to hold it in position to resist the pull. This chain slips somewhat either in starting or stopping, thus giving a very flexible arrangement for overcoming all shock to the machinery due to the momentum of the table. The motor load or friction is applied by means of an air cylinder F and crosshead box. When the machinery is new the surfaces of both friction wheels  $f_1$ ,  $f_2$  touch, but the box and

admits air to the signal and latching cylinders  $l_1$ ,  $l_2$ , throwing the signal to white and the latches into their pockets. By means of a small air whistle signals can be given to the man on the engine. After the engine is set the right hand valve is released, the latches are drawn in and the signal S changed to red. The left hand, or large four-way valve  $V_2$  is now turned in the direction in which it is desired to turn the table and air is admitted to the



Operator's Stand—Pneumatic Turn-Table.



Pneumatic Turn-Table.

friction cylinder allow for  $\frac{3}{4}$  in. travel—enough to equalize all wear and insure sufficient friction.

Only three valves are required to operate the table and the method is as follows: After the table is set, the right hand or small four way valve  $V_1$  is turned, which

motor M. The exhaust returns through this valve and is carried by a pipe to a point directly over the chain, where it keeps the latter clean and free from ice and snow.

After a few revolutions of the motor, the middle or three-way valve  $V_2$  is turned, air is admitted to the friction cylinder F, the load applied and the table moves. After the table begins to turn, the motor valve is opened wide and after full speed is obtained, the friction is released and the motor valve closed. This manipulation allows the table to travel a long distance by momentum, with consequent saving of air. In approaching a track where it is desired to stop the table, the friction is again applied. The chain and machinery act as a light brake and enable the operator to use the motor to promptly control the motion of the table.

The motor, which was furnished by the Chicago Pneumatic Tool Company, was furnished without the special four-way valve, but with a casting for the two pipes, thus enabling the operating valve to be remote from the motor. The motor speed is 240 r.p.m., with 80 lbs. air pressure. Engines weighing 155 tons, including tender, are frequently moved with an initial pressure of only 20 lbs.

With 80 lbs. pressure, and under severe winter conditions with the thermometer near zero, this table makes one complete revolution, light, in one minute, and when loaded with a 155 ton engine and tender, in  $1\frac{1}{2}$  minutes.

Compressed air and an endless chain have been tried on several small tables, but we believe that this is the first application to a large modern table for heavy service. This construction overcomes the use of an extra pit rail for adhesion. It is also light and flexible, which enables the table to be turned by two men in cases of emergency, when the motor is out of service.

The 60 ft. table at the Lambertville shops is similarly operated.

#### Fast Time on the Chicago & North Western.

Chicago & North Western train 12, the "Chicago Special," did some fast running on three successive days recently, a record of which is given below. The train consisted of an engine and five cars, the weight behind the engine on the first two days being 250 tons, and on the third 305 tons. The total weight of engine and tender was 134.4 tons. The run was from Council Bluffs to Clinton, Iowa, 350.4 miles, the schedule time for which is 523 minutes. Engines were changed at Boone, 148.1 miles from Council Bluffs. Both engines were Atlantic type, principal dimensions as follows:

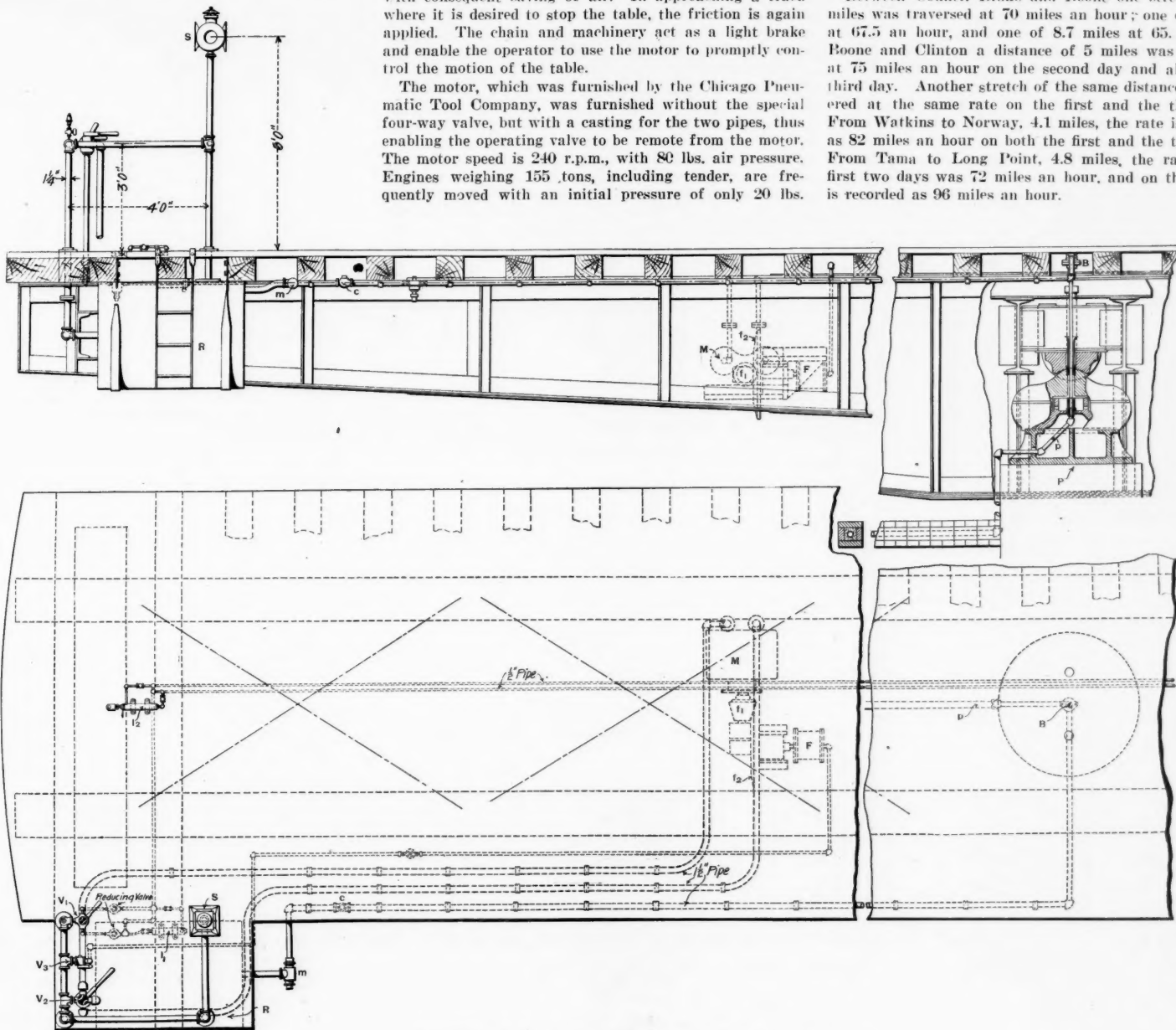
|                              |         |
|------------------------------|---------|
| Total weight of engine, lbs. | 158,000 |
| Weight on drivers, lbs.      | 91,000  |
| Cylinders, in.               | 20 x 26 |
| Drivers, in.                 | 74      |
| Heating surface, sq. ft.     | 3,016   |

The train was late out of Council Bluffs on all three days. The time made up was, on the successive days, 56 min., 53 min. and 80 min. While the average speed is not unusual, there were a number of good bursts of speed, one for a distance of 4.8 miles being reported as 96 miles an hour.

The record of movement follows:

|                           |            |             |             |
|---------------------------|------------|-------------|-------------|
| Engine                    | D 1024     | D 1024      | D 1024      |
| Left Council Bluffs       | 5:55 a. m. | 4:37 a. m.  | 5:25 a. m.  |
| Arrived Boone             | 9:13 a. m. | 7:53 a. m.  | 8:45 a. m.  |
| Distance, miles           | 148.1      | 148.1       | 148.1       |
| Stops                     | 5          | 5           | 5           |
| Elaps'd time, hrs. & mins | 3:18       | 3:16        | 3:18        |
| Actual running time       | 3:1        | 2:59        | 3:01        |
| Average speed, m. p. h.   | 49.15      | 49.70       | 49.15       |
| Engine                    | D 1082     | D 1083      | D 1086      |
| Left Boone                | 9:35 a. m. | 8:00 a. m.  | 8:50 a. m.  |
| Arrived Clinton           | 2:03 p. m. | 12:42 p. m. | 12:43 p. m. |
| Distance, miles           | 202.3      | 202.3       | 202.3       |
| Stops                     | 10         | 9           | 9           |
| Elaps'd time, hrs. & mins | 4:28       | 4:42        | 3:53        |
| Actual running time       | 4:00       | 4:11        | 3:36        |
| Average speed, m. p. h.   | 50.2       | 47.1        | 56          |

Between Council Bluffs and Boone one stretch of 4.7 miles was traversed at 70 miles an hour; one of 9 miles at 67.5 an hour, and one of 8.7 miles at 65. Between Boone and Clinton a distance of 5 miles was traversed at 75 miles an hour on the second day and also on the third day. Another stretch of the same distance was covered at the same rate on the first and the third days. From Watkins to Norway, 4.1 miles, the rate is recorded as 82 miles an hour on both the first and the third days. From Tama to Long Point, 4.8 miles, the rate on the first two days was 72 miles an hour, and on the third it is recorded as 96 miles an hour.



Arrangement of Valves and Piping—Pneumatic Turn-Table.



ESTABLISHED IN APRIL, 1856.  
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At 83 Fulton Street, New York.

#### EDITORIAL ANNOUNCEMENTS.

**CONTRIBUTIONS.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**ADVERTISEMENTS.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

A considerable proportion of the readers of the *Railroad Gazette* will find nothing new in the standard form of contract with the "Amalgamated Association of Street Railway Employees," which is printed in another column. The emotions of the railroad officer who has signed it probably fell short of those of John Hancock when he signed the Declaration of Independence. The right to choose the best men for special service and pay them accordingly; the right to employ good men because of their merit; the right to discharge men because of their demerit, all these are signed away. In the seventeen sections no hint is given of consideration for the owners of the property. The corporation makes seventeen promises which it must keep and which can probably be enforced at law. The Union makes no promise or assurance of any kind. An industrious, capable man cannot get work unless he is acceptable to the "combine." The injury to the corporation is slight, compared with the wrong done to the industrious workman who aims to better his condition.

The meeting of the American Railway Association next Wednesday marks the end of the first year of "Per Diem." The year of actual operation does not expire until July 1, but it was at the April meeting that the long fought battle was settled. Any road wanting to cancel the agreement on July 1 next would have had to give its notice by April 1. No such notice has been received, so that the official records confirm what appears to be the general opinion, that per diem has come to stay. The inequalities, difficulties and friction are not ignored or minimized, yet everybody appreciates the great good of working on a correct principle, and all appear to be determined to take no backward step. The arbitration committee has had nothing but matters of detail to settle, which indicates that the serious questions, such as the adjustment of allowance for switched cars, are not of a pressing nature. Per diem has strengthened the demurrage bureaus and demurrage has been an important, probably an essential, element in the success of per diem. A significant bit of recent news is that the New Haven road asks the Connecticut legislature to abolish the requirement that 96 hours' free time be allowed all consignees of bulk freight. The road, however, does not ask its Connecticut customers to conform to the reasonable rule of paying a dollar a day after 48 hours, but will accept 20 cents a day for the time from the 48th to the 96th hour. The basis principle, a per diem charge, is apparently agreed to after a one year's trial at a low rate per day. While establishing the principle it is now clearer than ever that 20 cents a day is too low a rate, and that it does not insure the prompt return of a car where the borrower can by keeping

it earn several dollars a day. Even a higher rate would not fully provide the desired incentive; but it would be more nearly equitable. Selling the use of a car at a low rate is often unavoidable, but the vice of the practice should be kept in mind. The demurrage rate charged customers, one dollar a day, is also too low in many cases. In large cities the value of the room for standing cars is often more than a dollar a day, and there is no fairness in asking the same rate here as in Watt's Flats or Smith's Ranch. Finally, there is the incompleteness in our present reform due to the failure to establish fair rates on the thousands of cars owned by shippers.

#### What the Trade Unions Overlook.

The utterances of trade union writers and speakers as revealed by the editorials in the official journals and the addresses of their officers convey to their constituents the belief that while it is the wage earner who produces all that is worth having on this earth there is an effort on the part of the capitalist and the employer to despoil him.

In none of these expressions do we find reference to the processes by which the wealth of the world has been developed, to the steps of that industrial and commercial progress which places the civilization of the twentieth century in advance of that of the Middle Ages. Is it to the weaver for wage that mankind owes the better clothing that all men wear, or to the inventor of the power loom, the builders of factories, the organizers of methods for obtaining the material and distributing the product? The man who attends the power loom is a useful factor, but is his daily work of more value than that of the hand weaver of a few generations ago? Although his reward is immeasurably greater, is his actual contribution to the finished product of as great value in proportion as that of the hand weaver?

And so also throughout the industries, the daily effort of the wage worker who performs a prescribed task obtains value in far the greater degree from the environment which has been made for him and not by him. It has been said that over a bridge at Constantinople ten thousand persons pass every day, but not a new idea in a thousand years. The lot of the laborer in the western world differs from that of the Turk in large degree because of the expression in machinery and method of the cumulative ideas of brainy men.

If one of John Mitchell's constituents were placed with pick and shovel on the outcrop of coal in a mountain fastness, of what value would be his daily work? The men who survey the markets, the men who survey the land, who determine the building and who provide the tracks, cars and tipples must do their work before the man with pick and shovel can begin. And suppose they make this provision that enables him to begin and no more, of what value is his labor? He digs five tons of coal and hauls it to the tipple. What then? Of what value is it to him unless it is sold? There must be men to carry it where it is needed and sell it there for him. Yet this is but a small part of the service that the administrative force of the company performs for him. The community pays that administrative force and through it pays the miner. If the community does not give adequate reward to the stockholder his capital is lost; it cannot be moved to another locality; it is gone. The miner has supplied none of the capital, none of the inventive or administrative ability, none of the preparation that has made his work possible and takes none of the risk of success: yet the labor leader howls that labor is all in all.

The truth is that capital is worth what it will bring and labor is worth what it will bring. A combination of capital that endeavors to secure more than the market return for investment sooner or later will jeopardize capital itself. A combination of labor that endeavors to obtain a higher wage than the market can pay, sooner or later will jeopardize the employment of labor. The one thing that such an effort on the part of either capital or labor can and does do is for a moment to roil and disturb the current that it cannot check.

#### The Northern Securities Decision.

The object of the proceedings against the Northern Securities company was to have it adjudged that the scheme, which is now everywhere known as "the Merger," was prohibited by the Sherman law, and to enjoin the further prosecution of it.

In commenting upon the collapse of the case of the State of Minnesota against the same company (*Railroad Gazette*, Feb. 28, 1902) we pointed out that in dismissing the bill of Minnesota, the court did not

go into the merits of the controversy, and that the troubles of the company would really begin when the Government of the United States began its proceedings. In this connection we said: "The issue between the United States on the one side and the Securities company on the other is whether the company is a combination to monopolize in part interstate commerce, or whether it is a trust in restraint of trade between the States. If it is one or the other, judgment will be pronounced against the company requiring the surrender of the stock which it holds of these railroads, or at least restraining it from exercising its rights as the owner of a majority of the stock." Referring to the convenience of the scheme for effecting such combination, we said further: "If the policy of the laws of the United States is against this kind of consolidation, we do not see how the Securities company will come out unscathed from the litigation." In indicating the lines upon which the controversy would proceed, we said again: "It seems to be largely a question of primary intent and necessary result of the combination. . . . In forecasting the final result, we must not lay too much stress upon the weight the court will give to the economic advantages of combination." Pointing out that economic considerations had not saved the Trans-Missouri Association or the Joint Traffic Association, or the Addyston Pipe & Steel Combination from doom, we said: "We opine that if the Supreme court shall finally be of opinion that the Northern Securities company is a combination for the purpose of monopolizing or restraining interstate trade, the fact of incorporation will not bring exemption from the common fate that has overwhelmed similar schemes of individuals, associations and States alike."

The controversy thus outlined is now a matter of history, and the result is before us in this decision.

In a brief but pregnant summary of the facts the court unanimously finds that the merger was a combination designed to suppress competition between the Northern Pacific and the Great Northern, interstate carriers, and, being in restraint of interstate commerce, was prohibited by the Anti-Trust law. The court further holds that if the New Jersey charter incorporating the company is to be construed as authorizing this restraint of competition, that State has no power to grant such charter. It was pressed upon the court that the economic results of the scheme were beneficial not only to the great interests entrusted to the company, but also to the public at large, in preventing ruinous competition and consequently, in the end, poor service. But the court finds these considerations unavailing. If the combination were forbidden, the judgment of the court must so declare and enjoin any further proceedings under it. The merger was pronounced wholly illegal.

We cannot concur with many opinions, going the rounds of the press, with reference to the effect which this decision will have, assuming it will receive the approval of the Supreme court of the United States. On the one hand there is a great deal of foreboding as to the effect upon the liberty of the American citizen in doing what he will with his own. It is claimed in some quarters that a serious blow has been struck at the right of private property, and that the decision is unconstitutional for that very reason. On the other hand, there is much elation of spirit among those who find in combinations of any kind the root of all evil. These assert that the decision is the beginning of the end of all trusts, and that it ushers in at last a new era of hope to the individual and of despair to the combination. There is yet another class of persons, few and lonely however, who profess to cherish the opinion that the decision will have no effect at all.

It is perhaps impossible to stem the tide of hysteria that often follows an important and interesting case like this. But we may just as well keep up the habit of trying to find out what the court really has done, and saying what we think plainly and truthfully. The merger was intended to bring these great interstate railroads under one management, and so to suppress competition hurtful to them both. No one really had any doubt on this point before, but Justice, being blind, could not see what all the world saw. She could hear, however, and having heard, she decided the fact to be just as everybody supposed it to be. The Act of Congress requires such a combination to be adjudged void and to be enjoined. In so doing, the court has not taken a step in advance of previous courts. The Supreme court did precisely this thing in the case against the Trans-Missouri Association, not only enjoined it but dissolved it. It did the same thing in the case of the Joint Traffic Association. And it broke up the combination of the Addyston Pipe & Steel company and others, which was designed to restrain competition in iron pipe as a commodity of interstate trade. In the first of these not-



able cases the question was chiefly whether the Anti-Trust law applied to carriers; the court held that it did. In the next, it was questioned whether the law applied to an agreement which provided that it should not be construed to be, nor should it operate in any way in violation of law; and whether the law itself was constitutional; the court held that the agreement restrained trade, that the law applied to it, the agreement itself to the contrary notwithstanding, and that the Sherman law was constitutional. In the Iron Pipe case the question was whether the law applied to the purchase and sale of a commodity intended for interstate trade; the court held that it did, and enjoined an agreement intended to restrict competition and enhance prices.

We cannot see therefore, in the body of the decision upon the merger, anything startling or alarming. Once finding restraint of competition as the direct result of the scheme, the Circuit court was so fettered by the previous decisions of the Supreme court that pronouncing the merger illegal was unavoidable, unless the armor in which the company was incased rendered it proof against the process of a court of equity. And this brings us to the novelty of the case as well as to its gravity.

Heretofore the court had dealt with agreements to do the thing prohibited by law. The Trans-Missouri and the Joint Traffic Associations were held together by an agreement, which expressed the illegal purpose. It was the same with the Addyston company. The court simply forbade the parties to the agreement to carry it out, and that was the last of it in each case. The difficulty in the present case was that there was not, on the surface, an agreement, but a corporation, to be construed. The corporate charter, which alone expresses the corporate purpose, may be searched in vain for one illegal feature. To buy and sell securities is now one of the common features of corporate charters, and one of the common practices of corporations. To buy, one must also hold. The charter of the Securities company suggests nothing violative of the Sherman law or any other law. Could the court go further and attribute to the corporation the unlawful scheme of the gentlemen who formed it? It could dissolve an illegal agreement, but it could not, in the ordinary sense at least, dissolve a State corporation. These were the novel questions which the court has decided in this case. The difficulties are perhaps greater to the lawyer than to the layman. But the court has solved them in a way that all can understand. It looks beyond the innocent corporate purpose of the company as expressed in its charter, and considers the purpose of its formation and the purpose to which it is put. It finds the company in possession of the majority of the stock of both railroad companies, and in control of them. It prohibits the Securities company from voting on the stock it holds and forbids it and others from doing anything else in furtherance of the unlawful purpose. It however authorizes the company to undo the transactions whereby it acquired the stock of the railroads. Thus is effected a complete paralysis of the merger scheme without tying up forever the railroad stocks in pawn. About all that the Securities company can now do is to undo. A good deal has been said to the effect that the decision interferes unlawfully with the right of private property. But it is one thing to interfere unlawfully with the right of property and quite another to interfere with the unlawful use of property. To vote on its stock so as to bring both railroads under one control on a non-competitive basis is a wrongful use of its property by the Securities company.

It has been argued that if the decision is good law, an individual could not acquire a controlling interest in two roads and then manage them to get the best results from his property. Probably not, if the court could find back of the management a restraint of competition, which brings us to an unlawful use of property. But aside from this it must always be borne in mind that the Sherman law was directed against that peculiar kind of interference with interstate commerce which results from contracts, combinations or conspiracies. If the gentlemen interested in the Securities company can devise a scheme which will not involve a contract, combination or conspiracy in restraint of interstate commerce, they need not fear the Sherman law. Congress may pass a law to meet such a case, but it has not done so yet. In deciding this case as it has, the court was simply carrying out the law as passed by Congress.

In granting the right to disentangle the large batch of stock of these railroads from the wreck of the Securities company, the court skillfully and mercifully saves a lot of good property to its owners with the simple admonition not to do so again—at least in this way.

The Trojan Coupler Company protests, in a letter on another page, against the replacement of the drop forge operating rods of its coupler with cast-iron or malleable iron imitations, which sometimes do not even conform in the essential dimensions to those originally supplied in new couplers. This recalls a similar practice in the early stages of the automatic coupler, when railroad companies persistently made repairs to couplers of foreign cars with any material they saw fit. This was especially true of knuckles and was perhaps the cause of more serious failures of couplers and draft rigging than any other one thing. Numerous instances were developed at that time in which railroad companies replaced knuckles with gray iron or alleged malleable iron castings which failed when subjected to any severe strain. This was such a serious source of trouble that the railroad companies soon learned that wrong repairs, even of foreign cars, and the use of inferior material in making repairs, was not an economy in the long run. The condition referred to in the communication which we print is quite as serious. It is reasonable to suppose that the manufacturers are putting into their product the best and most suitable material that they have been able to secure, after many years of trial and experiment, and the railroad companies should not be careless about the quality of the metal in substituting for the original parts castings which they can obtain from the nearest foundry. In this case the operating rods are subjected to some shock and are an essential feature of the operating mechanism of the coupler. If they become bent or broken because of an inferior substitution, the operation of the coupler is impaired and may cause accident or delay.

The President of the Republic of Mexico, acting through the Secretary of State, has issued a circular to the judges of the district courts throughout the Republic reminding them that usually they ought not to imprison locomotive engineers and other railroad men when a collision or derailment occurs or a man is killed on the track. The judges are reminded that railroad accidents are not intentional acts of the engineers and conductors, and that at the worst the culpability of these men must be light; that it is not rational to imagine a bad intention. The courts are reminded, however, that sometimes an arrest may be necessary; but in such cases there must be no delay in prosecution and bonds should be accepted when practicable. As the reader knows, many outrages have been committed in Mexico under the forms of law. Enginemen have been arrested because a tramp was run over, and arrests of this kind, for offences of which the accused was finally cleared, have been followed by months and even years of imprisonment. It is said that dead tramps have been cremated in the fire-box to destroy evidence. It is gratifying to be able to announce this increase of enlightenment in Mexico; but in New York city the rule to arrest enginemen and motormen for accidents, even unavoidable ones, is still in force.

The Illinois State Railroad Commissioners are again reported to be intending to order the railroads of that State to make a large reduction in their local freight tariffs; 25 per cent. for distances less than 150 miles, and, for distances beyond that, a reduction to bring the rates down to the level of those prevailing in Iowa, which would in most cases be a very large reduction. There was a report several weeks ago that the commission intended to take some action of this kind, but it was soon denied. Along with the present announcement comes the statement that the Illinois Manufacturers' Association protests against a "horizontal" reduction in all tariffs. This somewhat novel protest is based on the belief that the railroads will at once withdraw the very low commodity rates which are now granted to manufacturers. The manufacturers feel sure that the railroads, if compelled to reduce miscellaneous rates, would endeavor to maintain their revenue by advancing their special commodity tariffs. This, say the complainants, would kill the manufacturing growth of the State, which, they affirm, has been the result of low general rates in Iowa.

#### TRADE CATALOGUES.

*Seen from the Car* is the title of a 61 page pamphlet in the "Four-Track Series," issued by the New York Central. There is a description of the scenery between New York and Buffalo, as viewed from the car window, illustrated with numerous half tones. A condensed popularized history of the country passed through is also given, introducing such fresh, up-to-date passenger-department facts as that the rocks on the east side of the Hudson River, at Spuyten Duyvil, are several million years older than those of the Palisades on the opposite shore. It is rumored that the next issue in the Four-Track Series will contain a portrait of the brakeman who passed the most satisfactory examination for the position of paleontological guide and adviser plenipotentiary to passengers from Europe traveling on the 20th Century Limited.

The H. W. Johns-Manville Company, New York, sends an interesting leaflet entitled "How to Pack Gas Engine Cylinder Heads." Full directions are given for cutting gaskets, preparing the flange and applying the gasket, so that the most efficient service may be obtained. The difficulty of packing cylinder heads of gas engines for stationary, launch, and motor service, has been one of the discouraging features in the use of these engines. The method described in the leaflet is claimed to be the only

successful one to avoid the difficulties and secure the best results.

*Pauling & Harnischfeger*, Milwaukee, Wis., have issued a folder giving a list of the users of their cranes and hoists. They have in service almost 1,000 of these appliances, the list showing them to be well represented in various lines of industry. The list of foreign users is large. The names are given alphabetically, and the types of machines are classified, the capacity of each being given. There is also included a list of users of their I-beam trolleys, which are made in sizes from 1/2 to 20 tons.

The *Endura Company, Ltd.*, Detroit, Mich., has a little pamphlet on the merits of "Endura Enamel" for locomotive front-ends. It mentions that its heat-resisting qualities are such that it gives unusually long service and retains its black gloss. The enamel is elastic and is unaffected by temperature changes or the elements. A number of testimonials from mechanical officers of important roads are given. Other kinds of paints are also made by the company, a list of which is given.

The *American Linseed Company*, 100 William street, New York, has got out a pamphlet about soaps, lubrification, and other things. Its pure linseed oil soap is for cleaning street and steam railroad cars. "Lubrix" is a lard and linseed oil compound for general use in the machine shop; for drilling, threading, milling and lathe work.

The *C. W. Hunt Company*, New York, has sent us a small pamphlet describing the construction and uses of its plumbago laid manila rope.

#### The Curtis Steam Turbine.\*

The development which this paper describes is based upon the original theories and inventions of Mr. C. G. Curtis, of New York, whose ideas were first made the subject of patent application about 1895. Since that time these inventions have been the subject of experimental investigation at Schenectady under the direction of Mr. Curtis and the General Electric Company's engineers; the object of these experiments being to establish data and laws which would form a basis for the correct design of commercial apparatus. The difficulties of such an investigation are very great. All new facts must be established by the test of different machines or parts which are difficult and expensive to produce. About two years ago the results of these experiments gave us data which showed great commercial possibilities, and since that time work has gone on on a large scale in the production of commercial machines. The contracts for these machines now aggregate 230,000 h.p. in turbine-driven electric generating units, the largest size so far built being 7,500 h.p. Thus a great industry has been brought into existence in a very short time, and since the work has all been done in one place and by a few persons very little information concerning it has reached the public. This paper is the first printed matter which has appeared on the subject. The reason for this immense demand and production without publicity and in so short a time, is that the improvements effected are radical in economy, simplicity and efficiency of action.

The idea of the steam turbine is quite simple, and is similar to that of the water turbine or impulse wheel. The practical difficulty which has heretofore prevented the development of good steam turbines, lies in the very high velocity which steam can impart to itself in expansion, and the difficulty in efficiently transferring this motion to wheels at speeds practicable for construction or practical use. Steam expanding from 150 lbs. gage pressure per sq. in. into the atmosphere, is capable of imparting to itself a speed of 2,950 ft. per sec., and if it is expanded from 150 lbs. gage pressure into a 28 in. vacuum it can attain a velocity of 4,010 ft. per second. The spouting velocity of water discharged from a nozzle with 100 ft. head, is 80 ft. per sec. These figures illustrate the very radical difference of condition between water turbines and steam turbines. In both water and steam turbines the theoretical condition of maximum economy exists when the jet of fluid moves with a velocity equal to about twice that of the vane against which it acts. In water-wheels this relation is easily established under all conditions, while with steam the total power produces a velocity so high that the materials available for simple wheels and vanes are not capable of sustaining a proper speed relation to it under practicable conditions.

The general arrangement of a turbine generating unit of the Curtis type is shown by the drawings which accompany this paper. Its functions may be briefly described as follows, and are illustrated by Fig. 1.

Velocity is imparted to the steam in an expanding nozzle so designed as to efficiently convert nearly all the expansive force, between the pressure limits used, into velocity in the steam itself. After leaving the nozzle, the steam passes successively through two or more lines of vanes on the moving element, which are placed alternately with reversed vanes on the stationary element. In passing successively through these moving and stationary elements, the velocity acquired in the nozzle is fractionally abstracted, and largely given up to the moving element. Thus the steam is first thrown against the first set of vanes of the moving element, and then rebounds alter-

\*Abstract of a paper presented to the American Philosophical Society by Mr. W. L. R. Emmet.



nately from moving to stationary vanes until it is brought nearly to rest. By this means, a high steam velocity is made to efficiently impart motion to a comparatively slowly moving element. The nozzle is generally made up of many sections adjacent to each other, so that the steam passes to the wheels in a broad belt when all nozzle sections are in flow.

This process of expansion in nozzle and subsequent abstraction of velocity by successive impacts with wheel vanes is generally repeated two or more times, the devices for each repetition being generally designated as a stage. There may be various numbers of stages and various num-

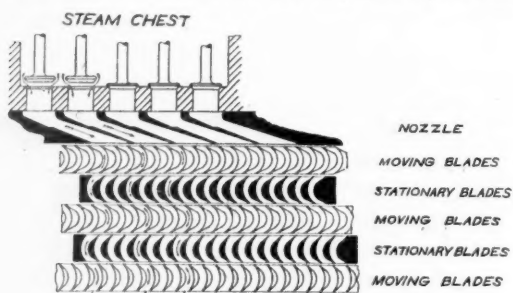


Fig. 1.—Diagram of Nozzles and Buckets.

bers of lines of moving vanes in each stage. The number of stages and the number of lines of vanes in a stage are governed by the degree of expansion, the peripheral velocity which is desirable or practicable, and by various conditions of mechanical expediency. Generally speaking, lower peripheral speeds entail more stages, more lines

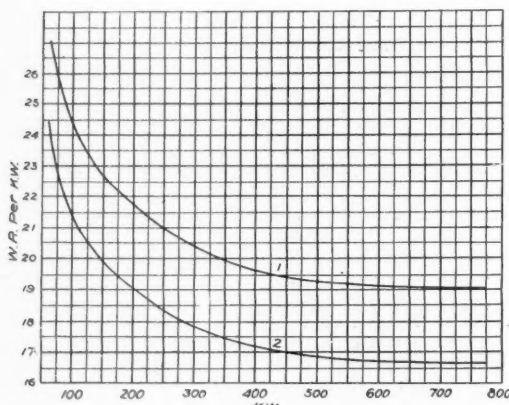


Fig. 2.—Curves of Water Consumption of 600 K.W. Turbine Using Saturated and Superheated Steam.

of vanes per stage, or both. Our general practice is to so divide up the steam expansion that all stages handle about equal parts of the total power of the steam. The losses and leakages of the earlier stages take the form of more heat or more steam for the later stages, and are thus in part regained. Much water of expansion, which

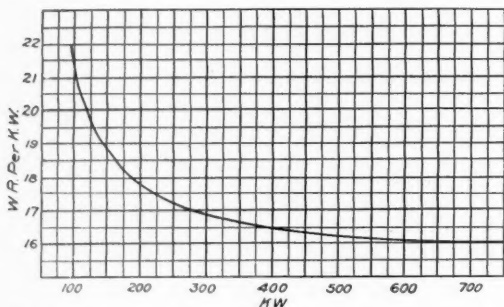


Fig. 3.—Curve of Water Consumption of 600 K.W. Turbine if Operated with High Pressure and Superheat.

might occasion loss by re-evaporation, is drained out of each stage into that which succeeds it.

The governing is effected by successive closing of nozzles and consequent narrowing of the active steam belt. The cut shows part of the nozzle open and part closed; the arrows showing space filled by live steam. In the

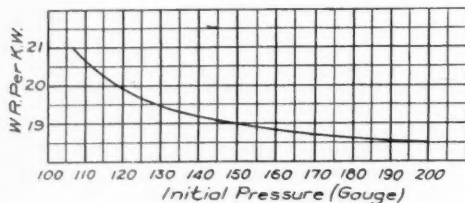


Fig. 4.—Curve Showing Effect of Change in Initial Pressure on Water Consumption.

process of governing, the nozzles of the later stages may or may not be opened and closed so as to maintain an adjustment proportional to that of the first stage, which is always the primary source of governing. Some improvement of light load economy may be effected by maintaining a relative adjustment of all nozzles; but in many cases the practical difference in economy is not great, and automatic adjustment of nozzle opening in later stages is dis-

pensed with in the interest of simplicity. In some machines an approximate adjustment is maintained by valves in later stages, which open additional nozzles in response to increases of pressure behind them. These are used as much for limiting the pressures in stage chambers as for maintaining the light load economy.

The principle of the Curtis steam turbine is susceptible of application to a variety of purposes. Within the scope of this paper I intend to give only a general idea concerning existing designs for its application to electric generators. Its development, even for this purpose, is very recent, and will doubtless be subject to important future improvements. In its present state, however, it embodies many important advantages, as has already been stated. The most important of these advantages is the high steam economy which it affords under average conditions of service. This economy is shown by the accompanying curves, which are derived from actual tests of the first commer-

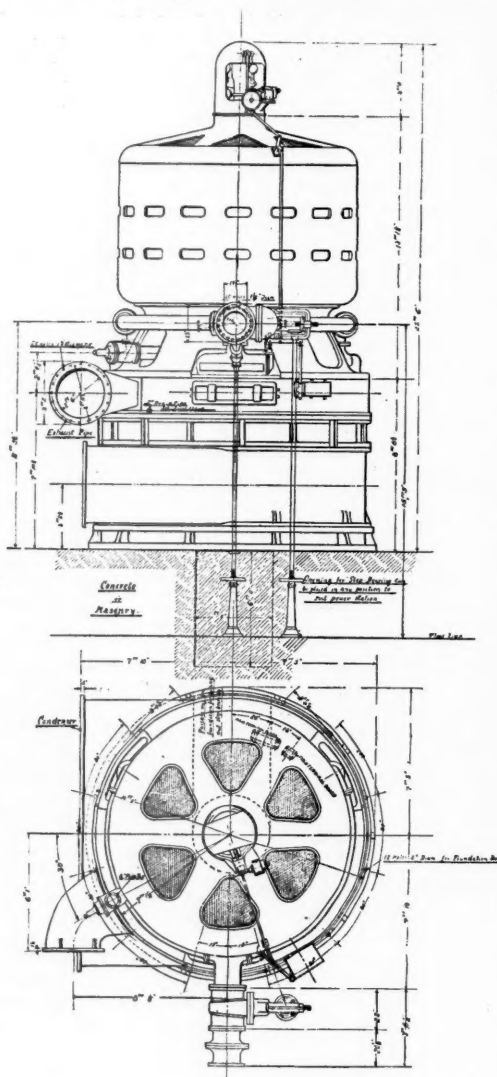


Fig. 5.—Plan and Elevation of 5,000 K.W. Curtis Turbine and Generator

cial machine of this type which was completed. This machine drives a dynamo of 600 k.w. capacity. The curves give its performance at a speed of 1,500 r.p.m., which is a safe and practical speed for commercial operation, and which corresponds to a peripheral velocity of about 420 ft. per sec. The results, with superheat, given in these curves are not derived actually from tests of this turbine, but are plotted from data obtained on smaller turbines. They correspond to the results obtained on turbines of other types, and are undoubtedly reliable.

Fig. 2 shows the steam consumption of this machine in pounds per kilowatt-hour output at various loads and under the conditions stated, the lower curve giving the steam consumption at various loads with 150 deg. superheat. Fig. 3 shows the results which could be obtained from this turbine if it were operated with high pressure and a high degree of superheat, these conditions of operation being perfectly practical with the machine, while with steam engines the use of such high temperatures would with ordinary constructions be prohibitive. The results shown by these curves are better than any heretofore produced by steam turbines of any make or size, and are very much better than those obtainable from the types of steam engines generally applied to the production of electricity. It should be noted that these curves show a very high efficiency at light loads, as compared with results obtainable from steam engines, and that the efficiency does not fall off at overload as it must necessarily do with all engines which operate economically under normal full-load conditions. This light-load and overload economy is an important feature of the Curtis turbine.

Fig. 4 shows the effect upon steam consumption of changes in the steam pressure. Superheat and vacuum curves (not shown) are straight lines so inclined as to indicate a great advantage by the use of all degrees of superheat and also an immense advantage in the use of very high vacuum. The most important reason why the

Curtis turbine so greatly surpasses the steam engine in economy is that it is adapted to use effectively the highest possible degrees of expansion, while in the steam engine it is practically impossible to provide for high degrees of expansion. As the exhaust pressure approaches a perfect vacuum, the volume naturally increases at a rapid rate—the volume of steam with a 29 in. vacuum being double that with a 28 in. vacuum. To handle high degrees of expansion, it would, therefore, be necessary to make cylinders of steam engines very large, and this increase of size and weight of parts fixes a practical limit which cannot be passed without excessive cost and complication. In the turbine, the highest degrees of steam expansion are easily obtained, and consequently a much larger proportion of the total work in the steam can be utilized by turbines than by steam engines.

The results shown by these curves are obtained from a machine of 600 k.w. capacity, and are naturally inferior to results which are expected from the very large units which are now being built. A 5,000 k.w. unit, which is now completed, will be put into operation in Chicago. This machine is expected to give considerably better steam economies than are shown by the accompanying curves, and will be superior particularly in the matter of light-load performance. The variation of efficiency in this machine from half load to 50 per cent. overload, will not exceed 3 per cent.

The external appearance and dimensions of this 5,000 k.w. unit are shown by Fig. 5, complete with prime mover and generator. It has been conservatively estimated that engine units, like those in the Manhattan Company's station, can be replaced by turbines like that in Chicago, and that the cost of such replacement can be paid for by saving in operating expenses in three years.

#### Foreign Railroad Notes.

The Orleans Railroad of France has just received a new locomotive that is the first of a series of eight soon to be delivered, and is designed to haul the fast trains between Paris and Bordeaux, a distance of about 375 miles, with but one change of engines, at Tours. The cylinders are compound and the wheel arrangement is the Atlantic type. The engine is designed to make speeds of 75 to 78 miles an hour, and a regular booked speed of 59 miles an hour. These speeds are attained by the compounds already in service; but the new engines, owing to their greater size and power, are expected to pull much heavier loads. They weigh 165,000 lbs., while the old ones weigh only about 100,000 lbs., exclusive of tender. The boiler center is very high and the tubes are very long, which proportions give them a graceful and handsome appearance. The throttle and reverse rod are on the left hand side as the signals on the Orleans are on the left. The engines are being built at Belfort.

The New Scotch Locomotive "Combine" is called the North British Locomotive Company. It is formed of the Sharp-Stewart, Dübs, and Neilson-Reid works. The capital of the company is £2,000,000, divided into equal parts of ordinary and preference shares, and the vendors take in payment the whole of the common stock and one-half of the preferred, as well, leaving £500,000 to be subscribed by the outside public. The preference shares are entitled to 5 per cent. interest, cumulative. These works will gain by co-operation to a large degree. The directorate is composed entirely of members of the selling firms.

The excavation of the Simplon Tunnel at the end of February amounted exactly to the total length of the Gotthard Tunnel. Seven and a half years were required for the excavation of the latter; while the Simplon has been only 4½ years under way, and has been considerably delayed by the unexpected flood in the south end.

The coal shipments from the three German mining districts during the first two months of this year were nearly 14 per cent. greater than last, an unmistakable indication of a favorable turn in German industries from the depression which began in 1900.

The Mediterranean Railroad of Italy is building 30 Göltsdorf two-cylinder compound 10-wheel engines. The company is also having built in Germany several three-cylinder tank engines with a leading and a trailing bogie truck.

#### TECHNICAL.

##### Manufacturing and Business.

The Brown Hoisting Machinery Co., of Cleveland, Ohio, has received a contract for an overhead trolley system from T. Alexander & Co., Barcelona, Spain.

The Waugh Draft Gear Co. has been incorporated at Chicago, with \$100,000 capital, by J. M. Waugh, A. N. Eastman and Frank White, to make railroad appliances.

The General Electric Company is to open offices in Yokohama, Japan. Mr. Geary, late of the company's foreign department, 44 Broad street, New York, will take charge.

The Trueblood Triple Automatic Car Coupler Co. has been incorporated with \$250,000 capital, at Huntington, W. Va., by S. L. Trueblood, F. B. Enslow and Geo. Macdonald.

The Trojan Car Coupler Co. will move its New York office from 36 Wall street to 500 Fifth avenue, April 15.



The main office will be removed from Troy, N. Y., to the above address June 1.

The Commonwealth Railway Supply Co., Chicago, has been incorporated to make, buy, sell and deal in railroad supplies of all kinds. The incorporators are E. B. Pickhardt, Roger Sherman and Robert McMurdy.

The firm of Milner & Caleb, General Sales Agents for the Bettendorf Axle Co., will be dissolved by mutual consent April 30. Mr. Caleb has acquired an interest in the Bettendorf Axle Co., and has been made Third Vice-President and General Sales Agent. The office of the company after May 1 will be in the Old Colony Building, Chicago.

The Pennsylvania Air-Brake Co., of Washington, Pa., a new concern, was noticed in our issue of March 27, 1903, page 237. At a meeting of the directors of this company April 7 it was decided to increase the capital stock to \$1,000,000. Bids for building the shops have been asked for. The company will make some new styles of air-brakes invented by its President, H. G. Manning.

The Washington Foundry & Machine Co. drew the first heat from its furnace at Washington, Pa., on April 9. This company was incorporated some time ago under the laws of Pennsylvania with a capital of \$20,000. H. G. Manning is President and George M. Davis, Treasurer. The works are equipped to turn out acid open hearth steel castings weighing from 1 lb. to 30,000 lbs., and common iron and brass castings. The fuel is natural gas.

The Chicago Pneumatic Tool Co. reports recent sales of pneumatic machinery to the Lake Shore & Michigan Southern, the Wabash, the Delaware & Hudson, the Central of New Jersey, the Pennsylvania Lines Northwest, and the Erie railroads; the Cambria Steel Co., the Baldwin Locomotive Works, American Bridge Co., American Car & Foundry Co., Omaha Boiler Works, Boston Bridge Works, Crerar, Adams & Co.; American Locomotive Co., and many other concerns.

The Rogers Metal Works, Kansas City, Mo., is making a car journal bearing for which excellent results are claimed. The wearing metal was originally intended for stationary practice, and its success led to its trial on cars. It has been used on the St. Louis & San Francisco, and a letter from Mr. John Forster, Master Mechanic, says that two bearings under a baggage car showed a reduction of metal in the crown of the brass of about  $\frac{3}{4}$  in. after 123,140 miles. The wheels were removed for worn treads, but the flanges were untouched.

The offices of the Pittsburgh Spring & Steel Co. have been removed from the German National Bank Building to the Farmers' Bank Building, Pittsburg. This company, which was organized last summer with a capital of \$500,000 all paid in and which purchased the McCandless Avenue plant of the Pressed Steel Car Co., has all its machinery installed and is now ready for orders for all classes of elliptic and coil springs. Mr. D. C. Noble, the President, and Mr. L. C. Noble, Vice-President, and Superintendent Proven, were associated with the A. French Spring Co. The company proposes to extend the shops so as to do business on a large scale, having ample capital.

#### Iron and Steel.

The Ford City Foundry & Machine Co. is being organized at Ford City, Pa., with \$200,000 capital.

The Cross Engineering Co., Carbondale, Pa., has been incorporated with \$100,000 capital, to make steel and iron.

The Texas Bridge Co. has been incorporated at Dallas, Texas, by M. S. Hasie, M. S. Hasie, Jr., and O. O. Alexander.

C. H. Duggan, of Montreal, has been appointed General Manager of the Dominion Iron & Steel Co., of Sydney, Cape Breton.

The Kenton Iron & Steel Co., Covington, Ky., has been organized with \$50,000 capital, by J. W. Arnold, C. E. Vokes and E. C. Kelly.

The St. Lawrence Iron & Steel Co., \$50,000 capital, has been organized at Syracuse, N. Y., by O. L. Buckley, C. E. O'Connor and W. F. Hodge.

The Carolina Steel Bridge & Construction Co., of Burlington, N. C., has a contract from the St. Louis & San Francisco Ry. for 6,000 tons of bridge material.

The Millmine Iron & Steel Co. has been incorporated at Toledo, Ohio, with a capital of \$60,000, by Henry B. Millmine, John M. Skinner, Alfred Millmine, Philip Metzger and Wm. E. Cordell.

The Maryland Steel Co., Sparrows Point, Md., has been awarded the contract for the steel floating dry dock to be installed at the United States Naval Station at Cavite, Philippine Islands. The accepted bid was \$1,124,000.

The American Engineering & Foundry Co., Los Angeles, Cal., has been incorporated with \$100,000 capital. Alpheus Redman, W. E. B. Partridge, W. D. Partridge, G. Davis and Richard J. Dillon are named as directors.

The Ohio Steel Erecting Co., Steubenville, Ohio, has been incorporated with \$100,000 capital under the laws of New Jersey. The following are named as incorporators: A. S. Buckingham and P. P. Lewis, of Steubenville; W. M. Musser, of Wilmington; E. W. Copper, of Pittsburg, and H. V. Gaskill, of Lisbon, Ohio.

#### Electric Long Distance Transmission.

A serious difficulty encountered in the transmission of alternating current of high potential is the proper insulation of the lines, so as to prevent serious accidents to employees and diminish the liability of breakdowns. Mr. Paul M. Lincoln recently read a paper before the Cleveland Electric Club pointing out that the reliance which has heretofore been put upon rubber as an insulator is not justifiable in view of recent serious accidents which have occurred. When the voltage on the Niagara-Buffalo line was raised from 10,000 to 20,000 volts, a number of tests were made on a wire covered with a high grade rubber insulation. The test specimens were short and successfully withstood a pressure of 70,000 volts, but after being put in operation on a 20,000 volt, three-phase circuit two breaks occurred in the insulation, although the normal strain was not more than 13,000 volts. The breaks in each case occurred at the mountings, showing that a constant brush-discharge occurred which produced chemical changes in the insulating material and destroyed its insulating properties. He therefore concludes that the mountings should be extra heavy in all cases, whether for indoor or outdoor purposes. Another case was cited in which a well insulated wire was enclosed in a lead covering, the lead covering being grounded. After a short time, over 100 breaks occurred and the difficulty was not overcome until the lead covering was removed. A breakdown on the high potential side of a transformer is liable to produce equally serious results on the low pressure side due to the surging of the current.

#### Briquetting Coal Dust.

The San Francisco & San Joaquin Coal Company, San Francisco, has decided to install machinery for the briquetting of coal dust, the high price of coal in California rendering this profitable. The briquetting presses will be driven by two Westinghouse electric motors of 40 h.p., each arranged to give any desired speed from 20 r.p.m. to 550 r.p.m. in about 15 steps.

#### Fence Posts.

The names of indigenous timbers which are best suited for fence posts, are given in the table following, with a recommendation, by a committee of the Engineering and Maintenance of Way Association, as to minimum diameter, if round, or girth if split, of small end, and as to proper size of staples to be used with each kind. The approximate value for fence purposes is about as in the order named:

|                              | Round, min.<br>diameter at<br>small end,<br>ins. | Split, min.<br>girth at<br>small end,<br>ins. | Suitable<br>length for<br>staples,<br>ins. |
|------------------------------|--|---|--|
| Catalpa .....                | 4  | 14  | 1½   |
| Bois d'arc (osage orange) .. | 3½   | 13  | 1  |
| Red cedar .....              | 5  | 18  | 1½   |
| Black cypress .....          | 4  | 16  | 1½   |
| Redwood .....                | 4½   | 18  | 1½   |
| Locust .....                 | 4  | 16  | 1  |
| Post oak .....               | 4½   | 16  | 1  |
| Chestnut .....               | 5  | 18  | 1½   |
| Chestnut oak .....           | 4½   | 16  | 1½   |
| Yellow pine .....            | 5  | 18  | 1½   |
| White oak .....              | 4½   | 16  | 1  |
| Spruce .....                 | 5  | 18  | 1½   |

#### Elevation of Outer Rail.

The following table for the elevation of the outer rail on curves is from the report of the Committee on Track of the American Railway Engineering & Maintenance of Way Association.

Elevation of Outer Rail in Inches.

| Deg. of<br>curve. | Velocity in miles per hour. |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-------------------|-----------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|                   | 10                          | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 |
| 1 0               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 2 ¼               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 3 ½               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 4 ¾               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 5 ¾               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 6 ¾               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 7 ¾               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 8 ¾               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 9 ¾               | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 10 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 11 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 12 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 13 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 14 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 15 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 16 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 17 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 18 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 19 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |
| 20 ¾              | ¾                           | ¾  | ¾  | ¾  | ¾  | ¾  | 1¼ | 1¼ | 1¼ | 2  | 2½ | 2½ | 3¼ | 3¼ | 4  | 4½ |

The committee concludes that it must not be understood that it is unsafe to run over a curve at a higher rate of speed than that for which it is elevated. That is to say, the train may safely run at 10 miles an hour over a curve which has no elevation; or, a train may run 60 miles an hour over a curve elevated for 50 miles an hour. It is bad practice, however, to run over curves at a speed greatly in excess of the speed for which they are elevated, as such practice increases the flange and rail wear, the cost of maintenance, the danger of accident and the discomfort of passengers. The table is not calculated beyond 70 miles an hour, but it might be of interest to know that if the calculation had been carried out for 80, 90 and 100 miles an hour, the elevations for a 1 deg. curve would be 4, 5½ and 6½ in. respectively. No doubt the committee thought that it was not advisable to run trains on any curve at a greater speed than 70 miles an hour.

#### Louisville & Nashville Improvements.

The Louisville & Nashville R. R. Co. has buildings under way to cost upwards of \$3,000,000. A 16-stall brick roundhouse with composition roof, to cost about \$30,000, will soon be built at the company's shops at Howell, Ind., near Evansville. Bids were opened on the 9th of this month, and work will be begun in a few days. Plans are being prepared for a \$95,000 passenger station and a \$35,000 freight station to be built at Knoxville, Tenn. Extensive locomotive and car shops are being built at South Louisville, Ky., to cost equipped approximately \$2,200,000. The buildings are to be of skeleton steel construction with brick apron walls and composition roofs. Plans for these structures have been prepared and contracts for the steel work have been let to the American Bridge Company; Louisville Bridge & Iron Company, and Grainger & Company, of Louisville, Ky. Work has begun on the foundations. Freight and passenger facilities at Evansville, Ind., are just being finished at a cost of about \$300,000, including a three-story passenger station faced with Bowling Green stone, and a brick freight depot 50 ft. x 700 ft. A 15-stall roundhouse and extensive yard improvements are under way at East St. Louis, Ill. A brick freight depot 50 ft. x 300 ft., to cost approximately \$25,000, has recently been commenced at Frankfort, Ky. John Fichtner & Son, of Louisville, Ky., are the contractors. A passenger station is also being built at Columbia, Tenn. The contractors are A. E. Hawthorne & Co., of Nashville, Tenn.

#### THE SCRAP HEAP.

##### Notes.

New signals are being erected along the line of the New York & Long Branch Railroad, preparatory to the adoption of the block system, between Elizabethport and Point Pleasant, about 49 miles.

According to Connecticut papers the New York, New Haven & Hartford Railroad has a bill before the Legislature repealing the law requiring railroads to allow consignees four days in which to unload a freight car and making the limit two days.

According to the San Francisco *Chronicle* the number of colonists entering California on special rate tickets during six weeks ending March 28, was 16,163. For most of the time the number going through El Paso was nearly as large as the number through Ogden.

The congestion of freight at Memphis since the first of April has been so serious as to cause long delays. On April 4 the Illinois Central was obliged to declare an embargo on all goods for that city except perishable. The embargo was partly lifted, however, within a few days.

The Pennsylvania Railroad is to have an "electro-auto" baggage truck for use in Jersey City to move baggage from the baggage cars in the train-shed to the ferry boats. This baggage haul is a long one and at present most or all of the baggage is carried in "crates" about 6 ft. x 6 ft. and 8 ft. to 10 ft. long. These are drawn by horses.

The railroads between Memphis and Little Rock (both the St. Louis, Iron Mountain & Southern and the Choctaw, Oklahoma & Gulf) were obliged to suspend through trains ten days on account of the overflowing of the Mississippi River. The Choctaw road was not able to use its own tracks through until April 2, more than two weeks after the first suspension of traffic.

The Wisconsin Central is the first railroad on which the Chicago reporters have found a freight tariff (revised according to the advice of the Interstate Commerce Commission) in which notice is given that the railroad will allow free cartage, or will absorb switching charges in lieu of switching, on goods to and from industries situated on the lines of other railroad companies.

The Western Union Telegraph Company, which some weeks ago secured an injunction against the Pennsylvania Railroad, and which therefore continues to occupy the right of way of that road with its lines, and to do business over them, appears to be keeping up a persistent contest in the courts. Last week suits were begun against the Philadelphia, Baltimore & Washington (along which line there are a large number of wires leading to Washington) and the Philadelphia & Baltimore Central.

The State Railroad Commission of Alabama, under a law passed this year, has increased powers of control over railroad rates; and within a few weeks will take up the question of fixing rates on grain, hay, and other commodities. Shippers' associations are loudly demanding that the commission take action to put the freight rates of Alabama on a level with those of Georgia, where, in many cases, the prices charged for transportation are very much lower than for similar distances in Alabama.

The demand for the more direct and active government regulation of railroads, which has appeared at various times in the Canadian Parliament and press during the past year or two, has finally led to the appointment of a transportation commission, made up of Sir William Van Horne, Chairman of the Canadian Pacific; Mr. John Bertram, of Toronto, and Mr. Herold Kennedy, of Quebec. Messrs. Bertram and Kennedy are business men. It is expected that the commission will make a comprehensive investigation of and report on the whole question of state regulation.

The Florida Freight Claim Agency is an organization which has been formed at Jacksonville, with an authorized capital stock of \$10,000, to act in behalf of merchants and manufacturers in the collection of claims against



railroads. The President of the organization is Mr. John D. Baker; and he and two other business men constitute the stock company; but all shippers and receivers of freight are invited to become "members." It is the purpose to collect bills only for members. The Secretary is Mr. Paul E. Peck, recently claim clerk of the Atlantic Coast Line in the office of that road at Jacksonville.

The Mutual Fire Marine & Inland Insurance Company is the name of a corporation which has been chartered in the State of Pennsylvania in the interest of the Pennsylvania Railroad. This company has just begun business, and, it is said, will provide the fire insurance for all of the property to be insured against fire belonging to the Pennsylvania Railroad and its affiliated companies. The Pennsylvania Railroad already has an insurance department of long standing, but this department does not take risks on property owned by the auxiliary, or subsidiary or affiliated railroad companies. According to the *Philadelphia Press* the Baltimore & Ohio, the Norfolk & Western, and the Erie & Western Transportation Co. are to insure in the new company.

#### Per Diem Details.

The Arbitration Committee of the Car Service Committee of the American Railway Association has decided five cases. The Galveston, Harrisburg & San Antonio desired to be relieved from paying per diem on two cars of the Atchison which were damaged by a cyclone, and were held two months to be repaired. Notice was sent to the owner three days after the damage occurred. The committee holds that the G. H. & S. A. must pay the per diem, as the cause of damage is immaterial. The Chicago, Peoria & St. Louis wanted to be relieved of paying per diem on a car which had been held by it to find the location of the town to which it was destined, the name not being in Bullinger's Guide; but the name was in the Official Railway Guide, and the committee holds that the road did not use due diligence to ascertain the location of the town in question. The same company complained of the Terminal Railroad of St. Louis because the latter hung back about paying 20 cents each on 62 cars which were offered to it at 11:10 p.m., but were not delivered until after midnight. The recognized delivery track was full, but notice was given that the cars would be accepted on another track. The C. P. & St. L. claimed that 50 minutes was not sufficient time to make the delivery at the new place; this contention is sustained, the committee holding that the Terminal Railroad "failed to promptly receive" the cars. In another case the C. P. & St. L. sent a claim to the Terminal Railroad for refund of per diem which it had paid on cars delivered by the Terminal to it in error. The error was not promptly corrected, some of the cars not being sent back for two or three or more days. The Terminal acknowledged its liability but claimed that only one day per car should be allowed; a car wrongfully delivered should be returned the same day. The committee decides in favor of the C. P. & St. L. At Boston the Boston & Maine delivers cars to the Boston & Albany to be switched to the New England Gas & Coke Company, and the B. & M. pays the per diem for five days. A B. & M. car, delivered Sept. 14, was destroyed by fire on the gas company's tracks Sept. 28. Notice was sent to the B. & M. by the B. & A. Oct. 7, with the statement that the B. & A. would pay no per diem after Oct. 7 until the new car, to be furnished by the gas company, should be ready for service. The committee decides that, as the car was destroyed, Rule No. 7 releases the B. & A. from paying per diem after Oct. 7.

#### Texas Railroad Laws.

The Texas Legislature, which has just adjourned, enacted a large number of laws affecting railroads. Ten railroad merger bills were passed. These mergers simply mean the formal consolidation of lines that are already owned by the purchasing company. That for the Southern Pacific lines was, we believe, vetoed by the Governor. His action on the others is not reported. Other railroad measures were: An act authorizing the railroad commission to require trains to stop at all stations where public service demands; an act relating to the posting of bulletins by station agents of the time of arrival of all passenger trains, etc.; an act requiring lights to be burned on all main line switches; an act authorizing the sale of State lands to railroads for townsite, depot and terminal purposes; an act prohibiting railroads from working trainmen and dispatchers more than 16 hours continuously, without eight hours' rest; an act authorizing the railroad commission to require railroads to construct sidings and spurs at points where public service demands; an act authorizing railroad companies to construct an additional track or build a double track, and to issue bonds on same; an act providing for the inspection and disinfection of passenger cars.

#### The Pennsylvania's New Tunnel at Washington.

Plans prepared by Mr. W. H. Brown, Chief Engineer of the Pennsylvania R. R., for the tunnel under Capitol Hill by which trains from the South will enter the new Union station, were submitted last week to the Commissioners of the District of Columbia, the Secretary of War, and Mr. Bernard R. Green, Superintendent of the Building of the Library of Congress, by all of whom, under the law, they must be approved. The plans provide for two parallel single-track tunnels about 4,800 ft. long. Entering the tunnel from the south, the tracks will leave the main southwest viaduct at Virginia avenue and Second street, and curving to the northeast along an embankment will cross First street, west, and Canal street, southwest, on bridges. From Canal street there

will be a down-grade to the mouth of the tunnel just south of D street and west of New Jersey avenue, southwest, from which point the tunnel will continue to curve into First street, east, under which street, between the Capitol and Library buildings, it will run north to the station site. The Pennsylvania has been buying the land necessary for this part of the work and proposes to begin work between South Capitol street and C street north. The tunnel plans have been approved by the Commissioners of the District of Columbia, and by the Secretary of War so far as they relate to Government reservations.

#### Wireless Telegraphy for the Navy.

The tests of experimental wireless telegraph apparatus between Washington, D. C., and Annapolis, Md., have proved so successful that the Bureau of Equipment, Navy Department, has ordered 20 more sets of instruments to equip some ships, and a number of shore stations along the Atlantic and Pacific coasts.

### MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

#### Society for the Promotion of Engineering Education.

The annual convention will be held at Niagara Falls, N. Y., June 1 to 3.

#### International Association of Car Accountants and Car Service Officers.

The annual meeting will be held at Quebec, Can., June 17 and 18.

#### St. Louis Railway Club.

The annual meeting was held April 10, with about 250 members present. Dr. H. C. Fairbrother, of East St. Louis, read a paper on "Railway Surgery," and President Jno. J. Baulch read a paper on "The St. Louis Terminals Up-to-date." The present membership of the Club is 1,051. The following officers were re-elected: President, Jno. J. Baulch; Secretary, E. A. Chenery; Treasurer, S. G. Scarritt.

### PERSONAL.

—Mr. George F. Evans, Vice-President and General Manager of the Maine Central Railroad, with his wife and daughter, sailed from Boston for England on April 11.

—Mr. Francis Marion Cramer, the new Traffic Manager of the Toledo Railway & Terminal Company, was born in Sandusky County, Ohio, in 1868. His railroad service has been on the Toledo, Columbus & Southern, and the Wheeling & Lake Erie. In 1896 he was made commercial agent of the latter at Toledo, and later general agent.

—Mr. Nicholas Bartlett, Assistant Secretary and Local Treasurer of the Lake Shore & Michigan Southern, died at his home in Cleveland, April 8. Mr. Bartlett was born in Waltham, Mass., in 1822, and went to work for the Cleveland, Painesville & Ashtabula as a clerk in 1853. At the time of his death he was one of the oldest employees of the Lake Shore.

—Mr. G. J. Ray, Division Engineer of the Main Line and the Bloomsburg Divisions of the Delaware, Lackawanna & Western at Scranton, was born in 1876. Mr. Ray graduated from the University of Illinois (Civil Engineer) in 1898, and immediately commenced work in the engineering department of the Illinois Central Railroad. In June, 1900, he was appointed Assistant Engineer in charge of the engineering work on the St. Louis Division. The following year (1901) he became Supervisor of Track and then Roadmaster at Dubuque, Iowa.

—Hon. Henry W. Corbett, a Director of the Oregon Railroad & Navigation Company, and one of the principal owners of the street railroads of that city, died at his home in Portland, Ore., March 31. Mr. Corbett was one of the pioneers of Portland and of the State of Oregon, and one of its most public spirited citizens. He was United States Senator from 1867 to 1873, and was a prominent advocate of, and worker in, many of the most important early transportation enterprises, such as the Northern Pacific Railroad and various water transportation lines.

—The new Superintendent and Traffic Manager of the Annapolis, Washington & Baltimore, Mr. A. Emerson Shaver, is 45 years old. His first railroad service was on the Lake Shore & Michigan Southern as telegraph operator in 1879. The next year he went to the Pennsylvania Company as station agent. For four years he was with the New York, Chicago & St. Louis. In 1888 he was made station master of the New York & Northern. For a time Mr. Shaver was in private business but soon returned to railroading, and since 1897 he has been trainmaster of the Annapolis, Washington & Baltimore.

### ELECTIONS AND APPOINTMENTS.

*Atchison, Topeka & Santa Fe.*—J. S. Leeds has been appointed Manager of the Santa Fe Refrigerator Dispatch, with headquarters at Chicago, Ill., succeeding E. H. Davis, resigned.

*Baltimore & Ohio.*—H. H. Temple has been appointed Division Engineer Maintenance of Way, with headquarters at Connellsville, Pa., succeeding E. L. Adams.

*Canadian Pacific.*—Owing to ill health, General Superintendent J. W. Leonard has been granted a month's leave of absence, and the Assistant to the Second Vice-President, W. R. Baker, will assume the duties during Mr. Leonard's absence.

*Central Vermont.*—J. E. Bently has been appointed General Passenger Agent, with headquarters at St. Albans, Vt., succeeding S. W. Cummings, resigned.

*Chicago, Burlington & Quincy.*—C. E. Spence has been appointed Assistant General Freight Agent, with headquarters at Chicago.

*Chicago, Milwaukee & St. Paul.*—A new division of duties in the freight department has been announced, as follows: H. E. Pierpont, Assistant General Freight Agent in Chicago, will have charge of coal, coke, grain and products; N. J. Goll, Assistant General Freight Agent in Chicago, is to have supervision of all dairy traffic; R. M. Calkins, Assistant General Freight Agent in Chicago, will handle live stock, provisions, lumber and forest products, and W. E. Tyler, the new Assistant General Freight Agent, will have charge of paper and raw materials. J. T. Conley, Assistant General Freight Agent in Minneapolis, will have charge of freight at St. Paul, Minneapolis, Stillwater and all points north and west of those places.

*Chicago Railroad Association.*—W. H. Richardson, General Passenger Agent of the Chicago & Eastern Illinois, has been elected Chairman of the C. R. R. A., and D. M. Bowman, Vice-Chairman.

*Chicago, Rock Island & Pacific.*—J. M. Gruber, heretofore Assistant General Superintendent of the Great Northern, has been appointed General Superintendent of the Western District, with headquarters at Topeka, succeeding H. S. Cable, transferred to Cedar Rapids as General Superintendent of the Northern District, succeeding R. Williams, resigned. Effective April 20.

J. B. Kilpatrick, heretofore Master Mechanic at Horton, Kan., has been appointed Assistant Superintendent of Motive Power, with headquarters at Chicago, succeeding A. L. Studer, resigned. F. A. Marsh, Purchasing Agent, at Chicago, has resigned.

*Colorado & Southern.*—A. Zimmerman, Superintendent of Bridges and Buildings, with headquarters at Denver, Colo., has resigned.

*Denver, Northwestern & Pacific.*—R. Ogle has been appointed Superintendent of Bridges and Buildings.

*El Paso-Northeastern.*—W. C. Parsons has been appointed Superintendent of Machinery, with headquarters at Alamogordo, N. Mex., succeeding H. W. Ridgway, resigned.

*Great Northern.*—E. L. Brown has been appointed Assistant General Superintendent of the Eastern District, with headquarters at St. Paul, Minn.

*Illinois Central.*—J. W. Higgins has been appointed Assistant to the Second Vice-President. I. G. Rawn, formerly General Superintendent of the Baltimore & Ohio at Pittsburg, has succeeded Mr. Higgins as General Superintendent of Transportation of the I. C. W. F. Meath has been appointed Superintendent of Terminals, with office at Memphis.

*Lake Shore & Michigan Southern.*—R. P. Ahrens has been appointed Local Treasurer and Assistant Secretary, with headquarters at Cleveland, Ohio, succeeding Nicholas Bartlett, deceased.

*Lehigh Valley.*—P. H. Burnett has been appointed Industrial Agent, with office at New York city.

*Live Oak & Gulf.*—The officers of this company are: W. W. Mackall, President, with office at Savannah; D. E. Maxwell, Vice-President and General Manager; W. I. Lyman, Secretary and Treasurer, and O. M. Rabb, Auditor, all with offices at Jacksonville, Fla.

*Mexican International.*—W. F. Sheridan, heretofore Trainmaster of the Louisville & Nashville, has been appointed Superintendent of Transportation, with office at C. Porfirio Diaz, Mex.

*Minneapolis, St. Paul & Sault Ste. Marie.*—P. Swenson has been appointed Superintendent of Bridges and Buildings, with headquarters at Minneapolis, Minn., succeeding A. Amos.

*Missouri Pacific.*—See Wabash.

*Mobile, Jackson & Kansas City.*—H. H. Lane, Assistant to the President, Secretary and Treasurer, with headquarters at Mobile, Ala., has resigned.

*Montana Central.*—F. S. Forest, heretofore Superintendent of the Spokane Falls & Northern, has been appointed General Superintendent of the M. C., with headquarters at Great Falls, Mont., succeeding E. L. Brown. (See Great Northern.)

*Nashville, Chattanooga & St. Louis.*—The title of F. H. Scheffer has been changed from General Foreman to Superintendent of Machinery.

*New York State Railroad Commission.*—The Governor has re-nominated Frank M. Baker, of Owego, as Railroad Commissioner, for a term of five years.

*Northern Pacific.*—I. B. Richards has been appointed Superintendent of Car Service, with headquarters at St. Paul, Minn.

*North Shore.*—F. S. Stevens has been appointed Master Mechanic, with headquarters at Sausalito, Cal., succeeding P. J. Elliott, resigned.

*Pere Marquette.*—W. D. Trump has been appointed Assistant General Superintendent (a newly created office), with headquarters at Detroit, Mich. P. N. Place, heretofore General Trainmaster, has been appointed Superintendent of the Saginaw District, with headquarters at Saginaw, succeeding Mr. Trump, effective April 9.

*Seaboard Air Line.*—C. F. Stewart has been appointed Assistant General Passenger Agent, with headquarters at Savannah, Ga.

*Southern.*—The headquarters of C. S. McManus, General Superintendent of the Western District, are to be removed from Chattanooga to Birmingham, Ala.

*Spokane Falls & Northern.*—F. S. Forest, Superintendent, has resigned. (See Montana Central.)

*Stillmore Air Line.*—F. S. Battle, Superintendent, has been appointed Traffic Manager also.

*Tifton, Thomasville & Gulf.*—T. W. Geer has been appointed General Manager, with headquarters at Thomasville, Ga., succeeding C. P. Brown. W. F. Rudisill, General Freight and Passenger Agent; J. J. Anderson, Master Mechanic and Master Car Builder; G. J. Huson, Superintendent, and R. H. Brown, Auditor, have resigned.

*Wabash.*—W. C. Stith, Freight Traffic Manager of the Missouri Pacific, will, on May 1, become Assistant Vice-President of the Wabash, the M. P., and the other Gould Lines, his territorial jurisdiction being the same as that of Mr. A. C. Bird. Office at Chicago.

*Waterloo & Cedar Falls Rapid Transit.*—R. C. Galyean has been appointed Signal Engineer, with headquarters at Waterloo, Iowa, succeeding A. I. Woodring, resigned.



## LOCOMOTIVE BUILDING.

The Pittsburgh & Lake Erie is having five locomotives built at the Schenectady Works of the American Locomotive Co.

The Cincinnati, Hamilton & Dayton is having 10 locomotives built at the Pittsburgh Works of the American Locomotive Co.

The Pere Marquette is having 60 locomotives built at the Brooks Works of the American Locomotive Co. Some of these have been reported in our previous issues.

The Chicago Junction has ordered five simple mogul switch locomotives to be built at the Schenectady Works of the American Locomotive Co., for October, 1903, delivery. These locomotives will weigh 109,000 lbs., with 97,000 lbs. on drivers; diameter of cylinders, 18 in.; straight type of boiler, with 200 lbs. working steam pressure; 200 National tubes, 2 in. in diameter and 11 ft. long; fire-box 96 x 33 1/2 in.; tank capacity, 4,000 gal. of water and eight tons of coal. Special equipment includes American-Westinghouse brakes, Western bell ringer, hammered iron axles, National hollow brake-beams, Sargent brake-shoes, Gould couplers, Star head-lights, Monitor injectors, bronze journal bearings, U. S. metallic piston and valve rod packings, Nathan sight feed lubricators, crucible cast-steel springs and Crosby steam gages.

The Missouri Pacific has ordered 50 simple consolidation locomotives from the Brooks Works of the American Locomotive Co., for January, April and May, 1904, delivery. The locomotives will have 19 1/2 x 28 in. cylinders, 55 in. drivers, extended wagon top boilers, with a working steam pressure of 200 lbs.; 304 tubes, 2 in. in diameter and 14 ft. long; fire-box 8 ft. 1 in. long and 6 ft. 7 in. wide; grate area, 53.2 sq. ft.; tank capacity, 5,000 gallons of water and 10 tons of coal. The special equipment includes: American-Westinghouse air-brakes, steel axles, magnesia boiler lagging, Sterlingworth brake-beams, Tower couplers, Handlan-Buck headlights, Monitor injectors, Sullivan piston and valve rod packings, Consolidated safety valves, Leach sanding devices, Nathan sight-feed lubricators, Railway Steel Spring Co.'s springs, Ashcroft steam gages and Latrobe truck wheel tires.

The Peoria & Eastern has ordered three express passenger locomotives, of the Chautauqua type, and five consolidation freight express locomotives to be built at the Brooks Works of the American Locomotive Co., for July and November delivery respectively. The passenger locomotives will weigh 186,000 lbs., with 100,000 lbs. on drivers; diameter of cylinders, 20 1/2 in.; radial stay wagon top boilers, with a working steam pressure of 200 lbs.; 344 Allison tubes, 2 in. in diameter and 16 1/2 in. long; fire-box, 97 in. long and 68 in. wide; grate area, 45 sq. ft.; tank capacity, 6,000 gal. of water and 10 tons of coal. The freight locomotives will weigh 190,000 lbs., with 170,000 lbs. on the drivers; diameter of cylinders, 22 in.; 56-in. drivers; Improved Belpaire wagon top boilers, with a working steam pressure of 200 lbs.; Otis steel; fire-box, 108 in. long and 68 in. wide; grate area, 51 sq. ft., with a tank capacity for 6,000 gal. of water and 12 tons of coal. The special equipment for both includes Westinghouse brakes, magnesia boiler lagging, National Hollow brake-beams on passenger locomotives, and Sterlingworth brake-beams on freight; Janney M. C. B. standard couplers, Jerome & Brooks piston rod and valve rod packings, Nathan triple sight feed lubricators, Railway Steel Spring Co. springs, Gold steam heating equipment, Standard Steel Company's tires on driving wheels, Pyle National electric headlights on passenger locomotives, and Schroeder 16-in. lights on freight locomotives.

The Lake Shore & Michigan Southern has ordered 35 simple locomotives, 15 2-8-0, 10 2-6-2, five 2-8-0 and five six-wheel switching locomotives from the Brooks Works of the American Locomotive Co., for August delivery. The 15 2-8-0 locomotives will weigh 174,000 lbs., with 154,000 lbs. on the drivers, and have 21 x 30 in. cylinders, 62 in. drivers, radial stay boilers, with a working steam pressure of 200 lbs.; heating surface, 2,973.5 sq. ft.; 344 Shelby drawn seamless steel tubes, 2 in. in diameter and 15 ft. 6 1/4 in. long; wide fire-box, 100 in. long and 63 in. wide; grate area, 43 sq. ft.; tank capacity, 6,000 gallons of water and 13 tons of coal. The 2-6-2 locomotives will weigh 174,500 lbs., with 130,000 lbs. on the drivers, and have 20 1/2 x 28 in. cylinders, 80 in. drivers, radial stay boilers, with a working steam pressure of 200 lbs.; heating surface, 3,362 sq. ft.; 344 Shelby drawn seamless steel tubes, 2 in. in diameter and 19 ft. long; wide fire-box, 84 1/4 in. long and 83 1/4 in. wide; grate area, 48.6 sq. ft.; tank capacity, 6,000 gallons of water and 13 tons of coal. The five 2-8-0 locomotives will weigh 225,000 lbs., with 200,000 lbs. on the drivers, and have 23 x 30 in. cylinders, 57 in. drivers, radial stay boilers, with a working steam pressure of 200 lbs.; 486 Shelby drawn seamless steel tubes, 2 in. in diameter and 16 ft. 6 in. long; wide fire-box, 109 in. long and 74 in. wide; grate area, 56 sq. ft.; tank capacity, 7,500 gallons of water and 16 tons of coal. The switching locomotives will weigh 145,000 lbs., and have 20 x 26 in. cylinders, 52 in. drivers, radial stay boilers, with a working steam pressure of 180 lbs.; heating surface, 2,326 sq. ft.; 279 Shelby drawn seamless steel tubes, 2 in. in diameter, and 14 ft. 11 1/4 in. long; fire-box, 72 1/2 in. long and 62 1/4 in. wide; grate area, 31.3 sq. ft.; tank capacity, 4,500 gallons of water and 15,000 lbs. of coal. The special equipment for all includes: American-Westinghouse air-brakes, steel axles (L. S. & M. S. specifications), Sansom bell ringers, Franklin sectional asbestos boiler lagging, National-Hollow brake-beams, Sargent brake-shoes, Tower couplers, Adams & Westlake headlights, Monitor injectors, Damascus journal bearings on 2-8-0 and 2-6-2 locomotives, and bronze journal bearings (L. S. & M. S. specifications) on switching locomotives, U. S. metallic piston and valve rod packings, Ashton safety valves, "She" sanding devices, Nathan sight-feed lubricators, Railway Steel Spring Co.'s springs, Crosby steam gages, L. S. & M. S. standard steam heat equipment on 15 2-8-0 and 2-6-2 locomotives. Other specialties for 15 2-8-0 and 2-6-2 locomotives are: Steam heat connection between engine and tender 1 1/2 in. McLaughlin flexible conduits.

## CAR BUILDING.

The American Car & Foundry Co. has miscellaneous orders for 94 cars.

The Grand Trunk has ordered 300 stock cars from the American Car & Foundry Co.

The Chesapeake & Ohio has ordered 1,000 gondolas from the Pressed Steel Car Co.

The U. S. Leather Co. has ordered 50 tank cars from the American Car & Foundry Co.

The Temple Iron Co. has ordered 200 mine cars from the American Car & Foundry Co.

The Lehigh Valley Coal Co. has ordered 100 mine cars from the American Car & Foundry Co.

The Elgin, Joliet & Eastern has ordered 260 steel coke cars from the American Car & Foundry Co.

The Erie has ordered 1,000 hopper gondolas, 100,000 lbs. capacity, from the Pressed Steel Car Co.

The El Paso & Southwestern has ordered 50 ore cars, 100,000 lbs. capacity, from the Pressed Steel Car Co.

The St. Louis Refrigerator Co. has ordered 100 refrigerator cars from the American Car & Foundry Co.

The Chicago, Lake Shore & Eastern is having 250 freights built at the Detroit Works of the American Car & Foundry Co.

The Wabash has ordered 1,500 coal cars from the American Car & Foundry Co. These will be built at the Madison Works.

The Interborough Rapid Transit will soon let a contract for 500 cars for use in its subway, in addition to those already reported, and for 150 cars for use on the Manhattan Elevated.

The Trenton Street Ry. has placed an order with the J. G. Brill Co., of Philadelphia, for five high-speed cars to be used on its Pennington branch.

The Lake Shore & Michigan Southern, as reported in our issue of April 10, has placed an order with the Rodgers Ballast Car Co. for 100 class CS 40-ton wooden ballast cars, to be built at the West Detroit Works of the American Car & Foundry Co. These cars are to be standard type.

The Pennsylvania has ordered 1,510 class X1 box cars, 300 class G1 self-clearing gondolas, 277 class Gsa all steel gondolas with drop ends, and 113 class Fm flat cars from the American Car & Foundry Co. All these cars are to be built according to the Pennsylvania standard designs, for use on the Lines West of Pittsburgh.

The Louisville & Nashville is building 550 box cars of 65,000 lbs. capacity at its shops. The cars will weigh 36,000 lbs., and measure 36 ft. long, 8 ft. 3 in. wide, and 7 ft. 2 1/4 in. high, all inside measurements. The special equipment includes: L. & N. brake-shoes, Westinghouse air-brakes, L. & N. brasses, Major couplers, L. & N. door fastenings, Wagner doors, Miner draft rigging, L. & N. journal boxes and paint, metallic roofs, L. & N. trucks and cast-iron wheels.

The Niles Car & Mfg. Co., as reported in our issue of March 20, is building 11 passenger and five combination passenger and smoking coaches for the Vandalia. These cars will be 70 ft. over end sills, and 78 ft. over extreme end of platform, with standard P. R. R. six-wheel trucks, 36-in. cast-iron wheels; 4 1/4 x 8 in. journals, wheel bases 10 ft. 6 in. The special equipment includes Forsyth curtain roller tips, P. R. R. heating system, Babcock fire extinguishers, Standard steel platforms, Edwards' curtain fixtures, Westinghouse high-speed brakes and Janney three-stem couplers. The cars are to be equipped with electric lights, and the necessary battery boxes, trays and switchboards. The fixtures and incandescent lamps will be furnished by the railroad company.

This company has already delivered 10 passenger coaches to the Seaboard Air Line. These coaches are 62 ft. over end sills, and 69 ft. over all. They are finished in quartered oak and the ceiling and deck are the modified Empire. The special equipment includes National drawbars, Pullman wide vestibules, with trap door lifting device, and rubber floors; steam heat in connection with Spear heater, Westinghouse high-speed brake and Pintsch gas. These cars are now running on the Florida special between Jersey City and Florida.

## BRIDGE BUILDING.

ATLANTIC CITY, N. J.—The Board of Freeholders have a second time asked for bids (until May 12) for two steel drawbridges on the road to Pleasantville.

AUBURN, PA.—The Board of Public Grounds and Buildings will receive bids until May 5 for a steel bridge over Schuylkill River.

BRIDGENORTH, ONT.—The Chemong Lake bridge between Ennismore and Bridgenorth, recently built at a cost of \$30,000, has been wrecked by moving ice and may have to be rebuilt. Address County Engineer, Peterborough, Ont.

BUFFALO, N. Y.—The Board of Councilmen is considering the question of a new bridge over the Buffalo River at Ohio street.

BURNSIDE, CONN.—An appropriation of \$10,000 has been made, according to report, for a stone arch bridge over Hockanum River.

CARROLLTON, KY.—M. I. Barker, President, writes that the Ohio Valley Traction Co. will soon be ready to contract for several small bridges to be built along its line from Covington, Ky., to Louisville. The only bridge of any size on this line is the one at Carrollton, which was recently built at a cost of about \$100,000.

COATESVILLE, PA.—The Westchester Street Ry. Co. is planning to build an overhead crossing.

COLUMBUS, OHIO.—Walter Bran, County Engineer, writes that the recent conference between the County Commissioners and railroad officers in regard to a viaduct at Reed avenue, was only preliminary, and that it will be some time before any definite action is taken. The city will issue \$12,000 bridge bonds.

L. E. Jones, County Auditor, will receive bids until noon, May 7, for the substructure and superstructure for the Rancke, Gantz, Price, Graham and Hayden Run bridges. The latter is estimated to cost over \$100,000.

CONNELLY, IND.—Jacob Luther, Commissioner, writes that the Commissioners of Clay County will receive bids on May 4 for a three-span 136-ft. iron bridge.

COSHOCKTON, OHIO.—The County Auditor, according to report, will receive bids until April 27 for the substructure and superstructure of the Hadden bridge.

FRANKFORT, IND.—The Commissioners of Clinton County will receive bids on May 6 for four steel bridges measuring respectively 80, 60, 30 and 10 ft.

GRAFTON, W. VA.—A bridge is proposed from the foot of Ethel street to the south side of the city, extending over the yards of the Baltimore & Ohio.

MONTREAL, CANADA.—The Canadian Pacific Ry. is reported to have recently given orders for 242 steel bridges as follows: Dominion Bridge Co., 160; Canada Foundry Co., 69; Hamilton Bridge Co., 11; King Bridge Co., 2.

NASHVILLE, TENN.—Newspaper reports state that the Louisville & Nashville plans to spend a large sum on a new bridge and approaches over Red River near Adams Station.

NEW YORK, N. Y.—Architect Henry F. Hornbostel, 63 William street, New York, will have plans completed in about a week for a steel and concrete bridge to be built over East Chester Bay in Pelham Bay Park. The bridge will be 1,100 ft. long and 50 ft. wide. The city Bridge Department has appropriated \$330,000, and bids will be asked for soon.

PALMER, MASS.—The selectmen have an appropriation of \$6,000 for a stone arch bridge in Thorndike, and \$5,000 for a steel bridge at Burleigh's crossing.

PHILADELPHIA, PA.—An ordinance has again been presented to the Common Council authorizing a loan of \$8,500,000 for the abolition of grade crossings.

Plans have been completed for the Philadelphia Rapid Transit Company's bridge over the Schuylkill River. Contracts are now ready to be let for the substructure.

ST. PAUL, MINN.—A bill has been introduced in the Legislature appropriating \$30,000 for an ornamental steel bridge over Minnehaha Creek at the Soldiers' Home.

SHEPHERDSTOWN, PA.—C. S. Churchill, Chief Engineer, writes that the Norfolk & Western R. R. will not rebuild the iron bridge over the Potomac River, as stated in various newspapers.

WASHINGTON, D. C.—It is probable that new bids will be asked for the new highway bridge across the Potomac, as the bids received either exceeded the appropriation, \$996,000, or did not conform to the specifications.

## Other Structures.

CANAL DOVER, OHIO.—The Pittsburgh Engineering Co. has been given the contract, for \$1,300,000, to build shops and install machinery for the Standard Motive Power Co., which was recently organized with \$10,000,000 capital to make locomotives under the Arthur P. Dodge patent.

KNOXVILLE, TENN.—The Louisville & Nashville has completed plans for its passenger and freight stations. The passenger station will be of brick, with terra cotta or stone trimmings, to cost approximately \$95,000. The freight station will be 50 ft. x 450 ft., of brick, with slate roof, and will cost about \$35,000.

PASSAIC, N. J.—The Passaic Steel Co. contemplates removing its bridge shops to a new location and building a modern plant with a capacity of 4,000 tons a month.

PORTLAND, ME.—According to newspaper report, the Maine Central R. R. repair shops at Thompson's Point have been badly damaged by fire.

ST. LOUIS, MO.—The Nashville Iron Works is said to have increased its capital from \$10,000 to \$50,000 for the purpose of enlarging its shops.

## RAILROAD CONSTRUCTION.

BENNINGTON-GREAT BARRINGTON.—A charter has been granted by the Vermont Legislature for an electric line from Bennington, Vt., south via Williamstown, Mass., to Great Barrington, 60 miles. A bill is now before the Massachusetts Legislature asking for a similar charter in Massachusetts. C. H. Cutting, C. Q. Richmond, H. W. Clark and others, of North Adams, Mass., are incorporators. Surveys are now being made but the exact route has not yet been located.

CANADIAN NORTHERN.—Press reports state that work will be begun within a short time on the main line of this road from Grandview. A length of 40 miles is already graded and is ready for the laying of the rails. Work will also be started shortly on the Prince Albert branch.

CANANEA, YAQUI RIVER & PACIFIC.—The concession obtained by this road from the Mexican Government has been revised. According to the new provision, the company will build from Naco, on the border of Arizona, and the State of Sonora, Mexico, via Cananea, to Villa de San Marcial, and thence in a southerly direction to the mouth of the Yaqui River, and eventually to the port of Topolobampo. Work on this road is already in progress. The Greene Consolidated Copper Co., which operates extensive copper mines at Cananea, is interested.

CHESAPEAKE & OHIO.—Surveys are reported completed for a new branch line from Raleigh, W. Va., to Birchfield, 22 miles, and it is stated that the contract for building this line has been let to Carpenter & Co., of Raleigh. Surveys are also reported for an extension from Twenty-mile Creek, the present terminus of the Gauley branch, on the Chesapeake & Ohio, to Charleston, W. Va., about 35 miles.

CHICAGO & NORTH WESTERN.—This company is straightening the line from Deadwood, S. Dak., to Lead, and as soon as the work is completed the road will be made standard gage. The old bridges along the route are being replaced by new ones.

CHICAGO, ROCK ISLAND & GULF.—Contract is reported let to Creech, Lee & Crane, Fort Worth, Texas, for an extension 2 1/2 miles long from Dallas south to a connection with the Houston & Texas Central.

CINCINNATI, BLUFFTON & CHICAGO.—The Bracey-Howard Construction Co., Chicago, have received a contract for building this line from Huntington, Ind., south-east via Bluffton and Pennville to Union City, 66 miles. A. T. Russell, Elgin, Ill., is Chief Engineer. (March 20, p. 220.)

COEUR D'ALENE & SPOKANE ELECTRIC.—An officer writes that contracts will be let the latter part of April for building this new electric line from Coeur d'Alene, Idaho, to Spokane. The character of the work will be light, with maximum grades of 2 per cent., and no tunnels or important bridges. F. A. Blackwell is President and I. C. White, Chief Engineer, Coeur d'Alene, Idaho. (April 3, p. 255.)

COLORADO, OKLAHOMA & TEXAS.—A charter has been granted this company to build from Denison, Texas, through Hobart, Cheyenne and Elk City, Okla. T., to Pueblo, Colo.

COLUMBIA RY.—Articles of incorporation have been filed by this company in Washington; capital stock, \$1,500,000. The incorporators are E. I. Tate, R. L. Thompson and F. C. Robinson, of Spokane, Wash.

CRIPPLE CREEK & PIKES PEAK.—This company, which was recently incorporated in Denver, Colo., proposes to build a line from Midway, near Cripple Creek, in a north-



erly direction to Gillet and thence northeasterly to Colorado Springs, 20 miles. A branch will also probably be built from Midway to Cripple Creek. W. A. Parkinson, F. A. Wright and others are incorporators.

DELAWARE & NORTHAMPTON.—See Railroad News.

DENVER, NORTHWESTERN & PACIFIC.—Contracts have been let for the grading of this new line from Utah Junction, where a connection is made with the Colorado & Southern and the Burlington & Missouri River, to Leyden Junction, 9½ miles. It was originally intended that the tracks of the Denver & Northwestern Electric should be used between Arvada, Colo., and Leyden Junction, but it was finally decided to build an entirely separate line, and for this reason the contract was let for 9½ miles instead of 4½, as reported in our issue of April 3, p. 255. Clough & Anderson, Colorado Springs, and E. C. Phillips & Son, Longmont, have received the contract.

EASTERN RY. & LUMBER.—Surveys have been completed and rights of way secured for the proposed line of this company in the Salzer Valley, Wash. Grading will be begun shortly.

FARMERVILLE & SOUTHERN.—A charter has been granted this company to build from Farmerville, La., north to the boundary line of Arkansas, to a connection with the Eldorado & Bastrop, about 26 miles.

GUNFLINT & LAKE SUPERIOR.—Articles of incorporation have been filed by this company to build a line from a point near the Canadian boundary in Cook County, Minn., in a southerly direction to Lake Superior. D. J. Arpin, Grand Rapids, Minn., is President, and Wm. Scott, Secretary.

HAWKESBURY & CALEDONIA SPRINGS.—Application will be made at the coming session of the Ontario Legislature for incorporation of this company to build from Hawkesbury, Ont., southwest via L'Original to Caledonia Springs, 20 miles. A connection will be made with the Great Northern of Canada at Hawkesbury. Kingswill, Hellmuth, Saunders & Torrance, Toronto, are solicitors.

ILLINOIS CENTRAL.—Rights of way are being secured by this company for an extension from Jackson, Tenn., to the Birmingham mineral district. The line will pass through Madison, Chester, McNairy and Hardin Counties, and work will be begun as soon as the rights of way are secured.

IOWA, ILLINOIS & WISCONSIN (ELECTRIC).—This company has been organized in Dubuque, Iowa, for the purpose of building an electric line from Dubuque to Plattville, Wis., 30 miles. The company is capitalized at \$750,000. Peter Keine, Dubuque, is President; C. H. Eighmey, Treasurer, and Chas. Peaslee, Secretary. Work will be begun at once.

JANESVILLE TRACTION.—A franchise has been granted this company to build an electric line through Janesville, Wis., and from Janesville northwest to Madison, 32 miles. It is stated that surveys will shortly be made.

KEEWATIN & ONTARIO.—Application is being made to the Ontario Legislature for a charter for this company to build from the western boundary to Rat Portage, and thence to the mouth of the Albany River at James Bay, with several branches in a southerly direction.

KEYSTONE TRACTION.—Charter has been granted this company to build from Sand Lick, McDowell County, W. Va., northeast to Mayberry, in Webster County. The incorporators are S. J. Evans, John Evans, D. E. French and others, of Keystone, W. Va.

LOUGHBOROUGH.—Application will be made at the coming session of the Ontario Legislature for an act to incorporate this company, with powers to build from a point on the Kingston & Pembroke east to Loughborough Lake, Ont. McGiverin & Haydon, Ottawa, are the solicitors.

LUKE, WESTERNPORT & KEYSER ELECTRIC.—This company has been incorporated to build a line from Luke, Allegheny County, Md., northwest to Keyser in Garrett County. Wm. Atkinson and Hugh Scott, of Lonaconing, Md., and John Mackie, Westernport, Md., are incorporators.

MEXICAN ROADS.—The Descubridora Mining Co., Inc., in the State of Chihuahua, Mexico, is about to build a railroad from Inde to its mines, a distance of about 45 miles.

Andrew Mackenzie has obtained a concession from the Mexican Government to build a line from Nuechiles, in the State of Vera Cruz, to San Juan de la Punta, with a branch line from Tierra Blanca to Vera Cruz.

The Mexican Government has granted a concession to the Mexican Anthracite Coal Mining Co. to build and operate a line between Cananea and a point on the Sonora R. R. The general offices of the company will be at Guaymas.

The Monterey Iron & Steel Co., of Monterey, is about to build a standard gage railroad from Nueva Laredo to the coal fields belonging to this company near the Rio Grande River, about 25 miles northwest.

F. S. Pearson, New York City, and J. E. Eldridge, of Chihuahua, Mexico, are making surveys for a standard gage line from Gallego, on the Mexican Central, northwest to Nueva Casas Grandes, 60 miles.

Surveys are reported in Lower California extending the entire length of the peninsula. It is stated that E. H. Harriman is behind the project and that a company will shortly be incorporated in Mexico to build the road.

MILWAUKEE & SOUTHERN.—Articles of incorporation have been filed by this company in Wisconsin.

MOBILE, JACKSON & KANSAS CITY.—A sub-contract has been let to the Worthington Construction Co. of Birmingham, Ala., for grading 11 miles of new road north and south of Newton, Miss.

MONTGOMERY COUNTY.—This company has been incorporated in Kansas to build from Havana to Caney, seven miles, connecting with the Atchison, Topeka & Santa Fe at Havana. H. U. Mudge, E. Wilder and A. A. Hurd are incorporators.

MOUNT POCONO-LA ANNA.—A company has been organized in Mount Pocono, Pa., to build an electric line from La Anna to Mount Pocono, 12 miles. J. B. Williams is President, and John Houck, of La Anna, Treasurer.

MUSKOGEE SOUTHERN.—The Kenefick Construction Co., of Kansas City, Mo., has been awarded the entire contract for building this road from Muskogee south via Spiro, Ind. T., to Fort Smith, Ark. (See Construction Supplement.)

NATIONAL R. R. OF MEXICO.—An officer writes that the change to standard gage of the line from Corpus Christi to San Luis Potosi, and from Mexico to Huehuetoca, has been completed. Ties have been laid on the section from San Luis to Gonzalez, 132 miles, for about one-third of the distance, and the rest will be finished in May. Work has been resumed on the section north from Tula River, and south from Gonzalez. There will be through standard-gage train service between Mexico City and Laredo. E. N. Brown, Mexico City, is Chief Engineer.

NEBRASKA, KANSAS & GULF.—This company has been incorporated in Kansas to build from Belleville, Republic County, Kan., south through Cloud, Ottawa, Saline, McPherson, Reno and Cowley Counties through Indian Territory to Fort Smith, Ark. H. F. Reddig, Kansas City; John Lambert, Joliet, Ill.; John Stewart, Concordia, Kan., and others are directors.

NEW JERSEY & PENNSYLVANIA TRACTION.—Work is reported begun on an extension of this line from Yardley west to Newtown, Bucks County, Pa.

NEW MEXICAN ROADS.—The Colorado Fuel & Iron Co. has purchased iron mines in Socorro County, N. Mex., near Oscura Peak, and proposes to build from Coyote, on the El Paso & Northeastern, to the iron mines, a distance of about 18 miles.

NORTHERN PACIFIC.—Press reports state that an extension will shortly be built from Stites, Idaho, along the south fork of the Clearwater River to Harpster, 12 miles.

OREGON SHORT LINE.—The Leamington cut-off from Garfield Beach, 18 miles west of Salt Lake City, south via Stockton to Leamington, Utah, 100 miles, is reported practically completed. The Utah Construction Co. are the contractors. (See Construction Supplement.)

PACIFIC & IDAHO NORTHERN.—This company is having plans drawn for the extension of its line from Council, Idaho, northeast to Meadows, 20 miles, and also for a probable extension to Stites, the present terminus of a branch of the Northern Pacific.

PENNSYLVANIA.—Contracts have been awarded to Millard & McGraw, Philadelphia, for the work necessary for a change of line on the Trenton cut-off at Pine Summit, Pa., and to Drake & Stratton, Philadelphia, for a change of line at Langhorn on the same division. Work will probably be finished about Oct. 1.

PORTLAND, VANCOUVER & YAKIMA.—Bids are now being asked by this company for grading the proposed line down Burnt Branch Creek, near Vancouver, Wash., to connect with the Washington & Oregon line. (April 3, p. 256.)

SAN JOSE & LOS GATOS (ELECTRIC).—Contract for building from San José south to Los Gatos, Cal., 10 miles, has been let to Geo. W. Elder, San Francisco. The new line will parallel the Southern Pacific between these two points. Work will be begun at once, and the road will probably be completed in about four months' time.

SEABOARD AIR LINE.—Contracts are about to be let for grading the rights of way recently secured in Birmingham City, Ala. Tracks will be laid on both sides of Avenue A, from 24th to 32nd streets, and also along 32nd street and Tenth avenue.

An officer denies that surveys are now in progress for an extension in Russell County, Ala., with a terminus at Opelika.

Contracts are reported let for the extension of this road from Rockmart southeast to Atlanta, Ga., as follows: Redmond & Co., Chattanooga, Tenn., four miles; Dunn & Co., New York, 20 miles; M. Casey & Co., five miles. J. W. Bushnell, Cedartown, Ga., is Chief Engineer.

SHEBOYGAN & ELKHART LAKE RY. & ELECTRIC.—Contracts have been let to James H. Collins Co., of Chicago, for building this line from Sheboygan, Wis., west to Sheboygan Falls, Plymouth, and Crystal Lake, and north to Elkhart Lake, 20 miles, with a branch southwest to Waldo, 10 miles. The company has secured right of way and graded about 12 miles. Work will be resumed very shortly.

SOUTHERN PACIFIC.—A contract has been let to Downing & Son, Palo Alto, Cal., for grading the double track from Lawrence east to Santa Clara. The contract calls for the removal of 60,000 cu. yds. of earth. Work will be begun at once.

SPOKANE & KOOTENAI.—The proposed route of this road is from Spokane, Wash., to Rathdrum, Idaho; thence via Sand Point and Bonner's Ferry up the Kootenai River to a connection with the Canadian Pacific on the Canadian boundary line. D. C. Corbin, Spokane, Wash., and Chas. S. Bihler, Tacoma, Wash., are incorporators. (See Construction Supplement.)

TEXAS & NEW ORLEANS (SOUTHERN PACIFIC).—A contract has been let to Brooks Bros., of China, Texas, for the extension of this line from Sour Lake to Sour Lake Springs, 8½ miles. E. B. Cushing, Houston, Texas, is the engineer in charge of the work. (April 3, p. 256.)

TEXAS & OKLAHOMA.—Surveys for the extension of this road to Wichita Falls, Texas, are reported completed, and work will be begun about May 1. It is not known which of the large companies is behind this project, but it is supposed to be either the Rock Island or the Missouri, Kansas & Texas.

TONAPAH R. R.—This company has been incorporated with a capital stock of \$2,500,000, to build from Rhodes to Tonopah, Nev., 63 miles. Wm. P. M. Braun, S. W. Greene and W. H. Hubbard, all of Camden, N. J., are incorporators.

UNION R. R.—Surveys are reported completed for an extension of this road from Duquesne, Pa., to the mines of the Mifflin Coal Co. E. C. Brown, Port Perry, Pa., is Chief Engineer.

VERNON, ROSWELL & EL PASO.—This company is now being organized in Texas. It proposes to build from Vernon, Texas, west to a connection with the El Paso Southwestern line at some point in New Mexico, a distance of about 300 miles. The proposed route will connect with the Blackwell, Enid & Texas line at Vernon.

WALLA WALLA & SOUTHEASTERN.—Articles of incorporation have been filed by this company to build a line east of Walla Walla and the Blue Mountains, in a southeasterly direction. Joseph H. McCabe is President, and A. H. Reynolds, Vice-President, both of Walla Walla, Wash.

WINFIELD & SOUTHERN.—It is reported that the final survey of this new line from Winfield, Kan., south to the coal fields of the Osage and Cherokee Nations is practically completed. J. W. Beatty, Winfield, is in charge of the surveys. The three banks of Winfield are included in the directorate. (See Construction Supplement.)

## GENERAL RAILROAD NEWS.

### New Incorporations, Surveys, Etc.

BRUNSWICK & BIRMINGHAM.—The control of this company has been sold to the Mohawk Valley Steel & Wire Co. The Brunswick & Birmingham is a projected line 375 miles long, extending from Brunswick, Ga., on the coast, to Birmingham, Ala. The road was chartered in December, 1900, and is about half completed. E. A. Machem has been elected President, and F. A. Umstead, Chairman of the Board of Directors.

CONCORD & MONTREAL (BOSTON & MAINE).—At a special meeting of the stockholders on April 9, it was voted to acquire the property of the Concord Street Ry., and to issue 5,000 shares of capital stock for that purpose.

DELAWARE & NORTHAMPTON.—This company, recently incorporated in New Jersey, has united with the Delaware & Northampton of Pennsylvania, and the New Jersey & Delaware River in making a mortgage of \$2,500,000, with the Knickerbocker Trust Co. of New York as trustee, covering all lines to be built in the interest of the Quaker Portland Cement Co. Gold bonds are to be issued, dated March 3, 1903, and due in 1953. The proceeds from the mortgage will be used in building a bridge across the Delaware River near Martin's Creek, and the proposed railroads to Buttzville, Oxford, Easton, Nazareth and Belfort, all in Pennsylvania.

DENVER, NORTHWESTERN & PACIFIC.—Right of way through the Gore canyon has been granted to this company. The right was contested by the New Century Light & Power Co., which is supposed to have been formed in the interest of the Gould and Harriman roads. The Denver, Northwestern & Pacific now has a complete right of way through to Kremmling, Colo.

KANSAS CITY, MEXICO & ORIENT.—A mortgage for \$10,000,000 has been filed by this company to secure the bonds issued by the United States & Mexico Trust Co. The mortgage covers all the property of the company in the United States and Mexico, including rolling stock, rights of way and equipment. A copy of the mortgage must be filed and recorded in each county through which the road passes.

LICKING RIVER.—This road has been sold to Hayward Brothers, of Boston, Mass. It was organized in 1899 as successor to the Licking Valley, whose property was sold under foreclosure proceedings. The line extends from Salt Lick to Cave Branch, Ky., 21 miles, with an extension from Yale to Salt Spring, eight miles.

NATIONAL OF MEXICO.—The first annual report of this company for the fiscal year ending Dec. 31, 1902, shows gross earnings of \$9,262,859; operating expenses of \$6,048,684, and net earnings of \$3,214,175, or \$1,329,428 in American money. This company was organized Feb. 24, 1902, as successor to the Mexican National. With the exception of the Guanajuato, San Luis de la Paz y Pozos, 31 miles long, which was owned prior to the taking over of property, and the Vanegas Cedral & Matehuala, 37 miles long, purchased on Oct. 9, 1902, by this company; the report covers the same properties as owned by the Mexican National. The complete mileage now operated is 970 standard gage, and 501 miles of narrow gage. The heavy decline in the price of silver since the beginning of the year has affected not only the dividend payments (gold) but also the cost of operating, because a large proportion of the operating expenses goes to the purchase of materials abroad which must be paid for in gold.

NEW CASTLE & EASTERN.—This company, which was recently incorporated in Pennsylvania, has taken over the property and franchises of the New Castle & Butler, which was organized in 1881, and which possesses terminal property in New Castle and a line 2½ miles long to Mineral Ridge. The New Castle & Eastern proposes to build from New Castle to Rose Point, Pa., eight miles. E. N. Ohl, New Castle, is President. (April 10, p. 274.)

NEW JERSEY TRACTION & LIGHT.—The committee appointed to negotiate for the consolidation of the New Jersey street railroad and electric light companies has submitted its report to the stockholders of the companies involved. These companies are the North Jersey Street Ry., the Jersey City, Hoboken & Paterson Street Ry., the Orange & Passaic Valley Ry., the Elizabeth, Plainfield & Central Jersey Ry., and the United Electric Company of New Jersey. The committee, which included A. J. Cassatt, J. I. Waterbury and John D. Crimmins, voted to accept the offer made by the Fidelity Trust Co. to organize a corporation for consolidating all of these companies with a capital stock of \$25,000,000. A prominent member of the committee says that \$10,000,000 of new money will go into the property and will be used for paying debts, making necessary improvements to bring the roads up to the highest state of efficiency and to meet other requirements. This \$10,000,000 does not go in as a lien ahead of present securities. The authorized capital is \$25,000,000. The amount to be now issued is \$10,000,000 in cash. The gas companies come in on a leased basis. The traction and electric light companies come in on perpetual interest bearing certificates.

NEW YORK, NEW HAVEN & HARTFORD.—In speaking of the new issue of \$12,439,000 of stock recently authorized by this company, President Hall stated that at least \$7,000,000 would be used for new rolling stock, including 4,000 freight cars, 75 locomotives and other equipment such as tugs and car floats. The \$2,000,000 first mortgage, 4 per cent. bonds, due July 1, 1903, are also to be paid out of this fund.

PUGET SOUND ELECTRIC.—This company, which was incorporated in December, 1902, has increased its capital stock to \$4,500,000. The new company will probably absorb the Seattle-Tacoma Suburban and the Tacoma Ry. & Power Co. The combined interests of these own about 98 miles of electric roads.

SOUTHERN PACIFIC.—Governor Lanham, of Texas, has vetoed the Southern Pacific merger bill which was passed at the recent session of the Legislature, and which authorized the Galveston, Harrisburg & San Antonio to purchase and operate the New York, Texas & Mexican, the Galveston & Northern, and the Gulf, West Texas & Pacific. The ground for the veto is that the roads involved are parallel and competing lines and that the bill is therefore unconstitutional.

The pool in the Southern Pacific stock has been dissolved. An official statement with regard to the number of shares purchased by the pool shows the holdings to have been 224,400 shares. The dissolution of the pool leaves the members free to dispose of their holdings as they please.